

# Regulatory Reform, Competition, and Innovation

## A Case Study of the Mexican Road Freight Industry

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Regulatory reform can spur innovations in infrastructure services, generating new downstream activities and magnifying the economywide benefits of reform. The national competition agency can help greatly in laying the groundwork for reform by making a compelling case for the reform's expected benefits.



## Summary findings

Discussions of competition and regulatory reform typically focus on price and quantity effects. But improving certain infrastructure services can also stimulate entry and competition in user industries downstream, allowing new firms to enter, incumbent users to offer new products, and rivalry to intensify.

Dutz, Hayri, and Ibarra present a case study of how innovations in road freight services affect selected downstream users of those services after regulatory reform. After a period of rigid regulation and heavy government interference, Mexico in 1989 developed a new policy framework for road transport, with free entry and market-based price setting. The result: faster, more reliable trucking has allowed user companies to offer new, previously unavailable products and to reach new areas with existing products. Cheaper, more customer-responsive trucking services have allowed logistical innovations in user firms, and some user firms have decided not to keep their own fleets of trucks but to outsource trucking services on the open market, thereby converting fixed costs to variable costs. For one fertilizer

company, the benefits of reform included a 10 percent improvement in operating margin.

Successful reform requires careful planning and execution and political support at high levels. Regulatory reform also profoundly changes the sectoral institution formerly responsible for the regulation. Enough resources should be provided to help organizations in the reformed industry make the transition to the post-reform environment — helping with such tasks as defining the organization's new role and facilitating the redeployment of staff.

The national competition agency can help greatly in laying the groundwork for reform by making a compelling case for the reform's expected benefits. After reform, the competition agency should also help with enforcement, to ensure that the cozy, cartel-like behavior stimulated by tight entry restrictions does not persist. In Mexico, three strong interventions were required to discipline attempted anticompetitive practices in the trucking industry in the years following reform.

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This paper is a product of Public Economics, Development Research Group. The study was funded by the Bank's Research Support Budget under the research project "Competition and Barriers to Entrepreneurship" (RPO 682-57). Copies of this paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Hedy Sladovich, room MC2-609, telephone 202-473-7698, fax 202-522-1154, email address [hsladovich@worldbank.org](mailto:hsladovich@worldbank.org). Policy Research Working Papers are also posted on the Web at [www.worldbank.org/research/workingpapers](http://www.worldbank.org/research/workingpapers). The authors may be contacted at [mdutz@worldbank.org](mailto:mdutz@worldbank.org), [ahayri@dtus.com](mailto:ahayri@dtus.com), or [ibarrarodriguez\\_pablo@jpmorgan.com](mailto:ibarrarodriguez_pablo@jpmorgan.com). April 2000. (48 pages)

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The invaluable field work assistance of Guillermo Abdel Musik (as survey team leader) and Sergio Garza, both at the Centro de Estudios Estrategicos at ITAM, Mexico City is gratefully acknowledged. The paper benefited from helpful suggestions by Cesar Cordova-Novion, Scott Jacobs and Benedicte Larre. The project was prepared under funding from the World Bank research preparation grant 'Competition and barriers to entrepreneurship' (RPO-682-57). This research reflects the work of the authors and does not reflect the views and policies of the World Bank nor the countries it represents. Correspondence: [mdutz@worldbank.org](mailto:mdutz@worldbank.org), [ahayri@dtus.com](mailto:ahayri@dtus.com), [pibarra@princeton.edu](mailto:pibarra@princeton.edu).



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## Executive Summary

Typically, discussions of the benefits of competition and regulatory reform focus on price and quantity effects in the market under consideration. However, improvements in certain infrastructure services also can stimulate entry and competition in downstream user industries, allowing new firms to enter, incumbent users to offer new products, and rivalry to intensify. To the extent that reform spurs innovations in infrastructure services, and these innovations in turn generate substantial new downstream activities, the economywide benefits of regulatory reform are likely to be substantially greater.

In this case study, we quantify the positive benefits achievable from innovations in road freight services on selected downstream firms that are intensive users of such services, following regulatory reform. From a particularly extreme degree of rigid regulation with a high degree of government interference, Mexico put in place beginning in 1989 a new policy framework for the road transport industry based on free entry and market-based price setting. Besides expected gains from reductions in trucking prices, there have been a number of additional sources of downstream gains. Importantly, faster and more reliable trucking has allowed user companies to offer new goods, both introducing previously unavailable products as well as making it possible for existing products to reach new areas. Cheaper and more customer-responsive trucking services have also led to a number of other logistics-related innovations within user firms. Finally, some user firms, instead of continuing to invest and maintain a private own-account fleet of trucks, have outsourced and purchased the services on the now more efficient open market. Although such costs are not largely sunk, tapping capital markets may not be an option for prospective entrants lacking reputation. An important additional benefit of a more competitive trucking service market, therefore, is to allow firms to outsource their transport requirements, in effect converting fixed into variable costs. The total up-side benefits are sizeable: the improvement in operating margin directly attributable to road freight innovations for a representative fertilizer company is a surprisingly large 10 percent.

An important political economy lesson is that successful reform requires careful planning, execution and high-level political support. Regulatory reform also causes profound changes in the sectoral institution formerly responsible for the regulation. Any regulatory reform effort should assign sufficient resources to assist such organization in making the transition to postregulatory reform conditions, assisting with such tasks as defining the organization's new role and facilitating redeployment of staff. Finally, the national competition agency can play a critical role in helping lay the groundwork for reform, by making as compelling a case as possible for the expected benefits of reform. In addition, the competition agency must play a careful post-reform enforcement role to ensure that cozy cartel-like behavior stimulated by tight entry restrictions does not persist. At least three separate strong interventions were required to discipline attempted anticompetitive practices by the trucking industry in the years following the initial regulatory reforms.





## 1. Introduction

The transport of freight is an input to the production of capital, intermediate, and consumer goods and services. As can be verified by input-output tables, it is almost impossible to think of a line of business that does not use transport. As such, any inefficiencies in transportation services as well as any monopolistic structures in its markets constitute an additional cost and at times a bottleneck for all other sectors of the economy. When adding unnecessary costs, inefficient transport services are equivalent to additional import or export tariffs. When constituting a bottleneck due to lack of capacity to move more freight in a more timely manner, they become equivalent to quantitative restrictions. Importantly, in addition to being seen as a means to reduce costs, more efficient transport and logistics systems are increasingly regarded as a means of boosting revenues and a source of competitive advantage. With the increasing emphasis of businesses on revenue-enhancement opportunities from logistics management and outsourcing, inefficiencies in freight transport can cripple a country's efforts to enhance its overall competitiveness. [Box 1]

In the Mexican transport sector, road freight transport on federal highways prior to 1989 was subject to a rigid regulation with a high degree of interference by government. Important government-imposed barriers to competition included entry restrictions to operate on federal highways, discretionary allocations of freight among truckers, and strong restrictions on moving cargo outside the established transport corridors. Official tariffs applied to all cargo and a semipublic company held a monopoly in handling containers. Regulations did not allow companies to charge higher rates for better service and hence no incentive to offer better services. Neither did they allow them to compete with one another by offering lower rates. As a result, the trucking industry was characterised by a limited number of firms operating with minimal competition. Moreover, to maintain this highly inefficient and archaic system, the government employed a sizeable bureaucracy.

In 1989, the government formulated a new policy framework to deregulate the road transport industry. The government's vision was to create a competitive trucking industry with free exit and entry and market-based pricing, without intrusive government regulation. The government focused its deregulation efforts in transportation and telecommunications with the belief that they accounted for major supply bottlenecks and market imperfections. Their reform was deemed essential to achieve more rapid and sustainable growth.

This study assesses the impact of regulatory reform in the Mexican road freight industry by focusing on selected downstream users. Following an overview of the political economy of regulatory reform, the evolution of regulatory structures is examined to provide a context for the subsequent impact assessment. The market impact of regulatory reform is assessed first by examining the evolution of market structure and conduct, and then by quantifying changes in performance. The major theme in the assessment of performance is the positive impact of removing bottlenecks for competition. In particular, we emphasise the large magnitude of downstream benefits possible from innovation and new products that accompany more intense rivalry in the provision of this essential upstream business service. The study concludes by highlighting remaining areas where further regulatory reform may yield additional economywide benefits.

## Box 1: Supply Chain Logistics – Moving Up the Corporate and Policy Agenda

Transportation and the somewhat broader concept of logistics (including warehousing, inventory and administration in addition to physical transport) have long been seen as minor cost items. Businesses did not believe that they could build competitive advantage based on logistics and hence ignored it. Similarly economic analysis recognised only the direct benefits of lower transportation costs. That was before the supply chain revolution in the industrialised world (supply chain management refers to the integration of the flow of goods, information and finance to move products from suppliers to manufacturers to retailers as efficiently and inexpensively as possible). First came the innovation of just-in-time inventory systems in 1980s. The idea was simple: the bigger a firm's inventories the larger its operating capital requirements. With more cost-focused management, such as ordering inputs just when needed, companies learned to slim down inventories. Importantly, they also realised that the infrastructure for just-in-time input deliveries could be useful for quickly changing designs and customising products. More cost-focused inventory management and flexible production technologies went hand in hand, leading companies to realise that supply chain management is not simply a means to reduce costs but a means to gain competitive advantage over rivals. Companies introducing overnight deliveries to their retailers and next-day service for their customers began to win substantial market shares from established competitors. The dynamic aspects of supply chain management for a manufacturer require feedback from retailers on daily sales mix and volume. The manufacturer responds to the feedback by changing design, sourcing and production volumes. Flexible manufacturing became the darling of business academics towards the end of 1980s.<sup>1</sup>

A key component of this process was the development of an efficient communications interface with suppliers, cutting back on transaction costs. On-line computer systems allowed companies to communicate with their suppliers as easily as they do internally. Efficient communications, however, lead to maximum gains only if goods flow as quickly as information. Logistics and communications are highly complementary factors especially for businesses that manufacture or distribute and market consumer goods. Top European industrial and service sector companies have reduced logistics costs to 7.5 percent of revenues in 1998 from 14.3 percent in 1987, and cycle times to 12 days from 27.2

As companies have learned to establish flexible links to their suppliers and customers, they grew more confident about aggressive outsourcing. It is now a mantra of management that except for a few core functions everything else should be outsourced.<sup>3</sup> Remarkably, about 70 percent of all U.S. Fortune 500 companies outsource some or all of their logistics activities.<sup>4</sup>

Outsourcing has an important feedback effect on logistics. Without outsourcing producers must either establish their own in-house distribution networks (costly to set up and difficult to manage) or rely on distributors or end-users to accept delivery at factories. Using third-party distributors or public warehousing and transportation facilities, even a small producer can have access to an extensive distribution network and pay only for usage. This brings down entry barriers created by large capital requirements, especially significant for countries with poorly performing capital markets and for prospective entrants lacking reputation. Despite improvements in financial markets, capital requirements remain as the only entry barrier that has a robust, positive correlation with supernormal profits. Therefore, the conversion of fixed costs into variable costs should spur competition in many industries.

In the new world of flexible manufacturing and outsourcing, linkages are becoming more important. Information and goods now flow faster and more accurately. As companies can exploit market opportunities without significant fixed costs, they compete more vigorously. Only companies that are able to communicate and interact efficiently and effectively with others stand a chance of expanding their business. They too have to share these benefits with consumers in the form of better service and lower prices. The backbone of this system is third-party providers of efficient logistics and communication services. Using their services, any firm, no matter how small and where located, can reach world markets.

In order to facilitate the benefits of the logistics revolution in their countries, policy makers should understand how third-party suppliers of logistics services emerge. This study is a first step in that direction. By taking a deeper look into the logistics operations of downstream user companies in Mexico that could have taken advantage of the recent deregulation of the road freight industry, we identify potential benefits as well as opportunities for improvement.

<sup>1</sup> See Sable and Piori (1990) on the emergence and relevance of flexible manufacturing.

<sup>2</sup> See AT Kearney (1998).

<sup>3</sup> See Porter (1997).

<sup>4</sup> Based on an October 1998 survey for the US Council of Logistics Management, as reported by E. Alden, 'Complexity prompts calls for third party', in *Financial Times*, *Supply Chain Logistics*, FT Survey, 1998.

A novel part of this study is that it benefits from an in-depth survey of 30 firms, 15 trucking companies and 15 intensive users of trucking services in Mexico's heartland undertaken in mid-1998.<sup>5</sup> The survey of shippers focused on three types of industries representing different common users in Mexico: agroindustrial, electronics and auto-parts firms, as well as general import distributors. The most detailed survey instrument combines technical data and subjective assessments of respondents in a consistent framework, thereby generating a set of numbers measuring the value to individual downstream firms of key upstream innovations associated with regulatory reform.<sup>6</sup>

## 2. Regulatory Structures and Their Reform

### 2.1 *The political economy of regulatory reform*

**Rationales for regulation.** Government regulation of the trucking industry in Mexico extends back to the late 1940s. However, lack of enforcement of existing regulation since its origin until 1977 was the main characteristic of this period. Most of the trucking companies did not have legal registration and most of the trucks did not have official authorization to circulate. In 1974, more than 7000 trucks did not have the corresponding permit or concession, while only 338 out of 1500 existing companies were legally registered.<sup>7</sup> In 1977, a gradual process of increasing regulation started with SCT's (the Mexican Ministry of Communication and Transport) Program of Development for Federal Trucking (*Programa de Desarrollo del Autotransporte Federal, 1977-1982*).

The Program fostered the revision of the constitutive deeds (*escrituras constitutivas*) of trucking companies. It also created three different committees: (1) state committees responsible for coordinating actions between SCT and the state authorities, including the construction of freight centers; (2) route committees to emit opinions for the grant of new concessions on specific corridors; and (3) technical committees to review 'broader' aspects — such as economic, industrial, or legal—to be consider for future reforms. Both the route and technical committees opened the door for an increasing involvement of trucking leaders in the design of governmental policy.

The regulation of road freight transport has been normally justified on grounds of safety, reliability of service and stability of rates. In the case of Mexico, the increasing regulation was justified on the need to provide a more reliable service and to protect transport infrastructure.

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<sup>5</sup> Of the carriers, 8 have their headquarters in Mexico City and the other 7 in Guadalajara, Jalisco. Of the shippers, 4 have their headquarters in Mexico City and 11 in Guadalajara. Of the 15 carriers, 6 are small companies with fleets of less than 30 trucks and 8 are larger companies with fleets ranging from 50 to over 400 trucks. The final transport firm interviewed, a multi-modal freight broker, owns no trucks and is representative of a new segment that operates as a link between Mexican trucking firms and international shipping companies.

<sup>6</sup> Our approach does not rely on measuring actual operational results of individual companies like the studies measuring the impact of privatization. Instead, we go through each major operating parameter of the company and construct counterfactuals. Thus we reconstruct each data point rather than simply measuring it. This allows us to achieve greater reliability with fewer data points. See Appendix 2 for an illustrative example of the most detailed survey instrument.

<sup>7</sup> As cited in Islas (1990), p. 117.

The apparent rationale was that open competition might: (1) disrupt economic activity through probable high price variability and uncertain service availability especially to less accessible regions of the country, and (2) lead to cost cutting practices that might result in increases in accidents and pollution (due to usage of older trucks, less maintenance, etc.).<sup>8</sup> However, the changes could also be interpreted as a set of measures that protect the interest of a handful of trucking families, and allowed the latter to implement more strict controls in the market. Before trucking deregulation, about 15 families controlled the whole industry, although it contained several thousand individual truckers.<sup>9</sup> Some of the most prominent truckers did not own a truck, but their power came from the control and ownership of freight terminals. As it happened in 1989, the decision to open the sector to competition unavoidably disrupted some of the most profitable operations.

**A broad market-based reform context.** Trucking deregulation was undertaken within the context of general reform rather than as an isolated action. From 1983 onwards, Mexico began a process of macroeconomic and structural reforms following the debt crisis and the collapse of oil prices. One of the many facets of reforms was to increase the reliance on market forces. International trade was liberalised through elimination of quantitative restrictions and reductions in tariffs as part of Mexico's commitments due to its new GATT membership in 1986.

Trade liberalization directly impacted the trucking industry. The collusion of truckers in Mexico was maintained through enforced territorial and cargo distribution of the market. Market distribution responded to transportation flows generated under the import substitution strategies followed for over 35 years. Trade liberalization brought changes to both trade flows and the structure of cargo movements. Exports increased three-fold over 5 years. Cargo increased substantially in the routes connected with international trade (Mexico City-Monterrey-Laredo, Mexico City-Veracruz, and Manzanillo-Guadalajara) but decreased relatively in domestic routes (Mexico City-Guadalajara and Guadalajara-Monterrey).<sup>10</sup> These changes altered the interest of the members of the trucking chamber and truckers in general. Truckers previously locked into unprofitable routes, individual truckers exploited by freight terminals and all downstream users could be expected to be strong supporters of trucking deregulation. The realignment of interest within the industry played in favour of the Salinas administration's goal of increasing competition and enhancing market contestability through deregulation.

**Institutional forces for change in trucking.** During the period 1988-89, major structural reforms were introduced by the Salinas administration including efforts to expand that market economy and strengthen the forces of competition. Within this context, the Ministry of Finance (*Secretaria de Hacienda y Credito Publico*, or SHCP) and the Office of Economic Deregulation within the Ministry of Industry and Trade (*Secretaria de Comercio y Fomento Industrial*, or SECOFI) argued for the deregulation of trucking. The deregulation of trucking in

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<sup>8</sup> World Bank (1993), p. 8.

<sup>9</sup> See Fernandez (1993), p. 105.

<sup>10</sup> Idem.

the United States in the early 1980s must have been an important factor because researches generally attached relatively high welfare gains to deregulation. One study, for example, estimated that the gains from deregulation as high as one third of total income generated from trucking.<sup>11</sup> Since the Mexican regulation was even more heavy-handed, the authorities had every reason to expect even bigger welfare gains from deregulation. A 1987 report by the Ministry of Communications and Transport (*Secretaria de Comunicaciones y Transporte*, SCT) estimated the welfare costs of trucking regulation at 0.5 percent of GNP.<sup>12</sup>

As part of the larger program of structural reforms to strengthen competition, SHCP and SECOFI took the initiative for the deregulation of trucking. The reformers had to deal with the possibility that the National Trucking Association could have immobilised the country in their opposition. Although deregulation was expected to benefit a large number of previously disadvantaged truckers, the real power of the trucking leaders had yet to be tested. This threat coupled with the absence of visible strong support from potential winners effectively led the reforming bureaucrats to adopt the following gradualist three-stage strategy. This process is yet to work itself out completely, since intra-state trucking still remains heavily regulated and technical regulations were largely ignored at the time.

**A three-stage approach.** In order to avoid interest-group pressures, the draft proposal was prepared by a small group, without open consultations with SCT or other parties. After the draft documents were prepared, the first stage of implementation was to solicit support from the affected industry associations, emphasising modernization rather than deregulation without ever openly mentioning strengthening of competition as an explicit objective. In accordance with the recently issued National Development Policy for 1989-94, which outlined the general policy framework, the government negotiated an agreement with the national trucking association (*Camara Nacional de Autotransporte de Carga*, CANACAR) under the terms of which CANACAR agreed to cooperate with the government in the deregulation and modernization of the industry. The agreement was signed on July 6, 1989. The agreement stressed the advantages of restructuring and modernising the industry. As a gesture to CANACAR, the government offered loans at preferential rates to truckers who wanted to renovate their fleets.<sup>13</sup>

The second stage, was the approval by decree on July 7, 1989 of new regulations eliminating most entry restrictions. Through this decree, the government effectively abandoned the public service notion that was behind the concept that trucking operations require a concession. The July regulations also allowed 'official' tariffs to be regarded as maximum rates. The third stage (deregulation part two) was the issuance of a decree in January 1990 abandoning tariff ceilings thus allowing rates to be freely negotiated between truckers and

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<sup>11</sup> See Moore (1975).

<sup>12</sup> As cited in World Bank (1990), p. 11.

<sup>13</sup> The authorities were reportedly aware that deregulation would lead to a substantial increase in supply, given the excess capacity created by the former regulation (private fleets were prevented from providing service to the broader public, route restrictions created a large number of empty return hauls, and freight center controls led to excessively long waiting times). Stimulating further supply through soft loans at that time can therefore not be explained by economic motives.

customers. The principal reason for issuing two decrees separated by six months was SCT's concern that if all deregulation actions were taken at once, the forces of competition may initially be too weak to prevent sharp price rises.

**Initial reform by decree.** Regulation was implemented by Presidential decree. It was not until late 1993 that the new law was published. The new regulation was only published in late 1994. This delay in publication of laws generated substantial uncertainty among carrier companies as many were not clearly informed of the new rules of the game, or expected an eventual reversal. Apparently, the signing of NAFTA accelerated the effective implementation of these regulatory reforms. The motivation for this phased approach, however, was strategic. It was expected by the reformers that a constitutional reform would take substantial time and meet stiff resistance within Congress. Although the PRI had a majority in Congress, transport association leaders had close connections with representatives in Congress who could have stalled the reform. It was therefore deemed more expedient to initiate reforms through decree (under executive authority) while carefully choosing the wording of texts in order not to contravene existing constitutional pronouncements. As an illustrative example, the prevailing law in 1989 stipulated that the provision of public road freight services requires a concession that must specify the specific route(s) that can be served by the concession holder. The modification introduced by the July 1989 decree eliminated all route restrictions by merely changing the definition of 'route' to 'any route covering the entire national territory'. The period between 1989 and 1993 was seen by the government as a test period during which they could have back-tracked had they faced excessive resistance. In spite of the uncertainty created by ambiguous rules of the game, the approach taken was a pragmatic approach that minimised the risk of a reversal.

**Concessions, permits and the public service provision.** To improve transparency and ensure the permanence of the reforms, a radical step was the reform of the law that took place in 1993. Prior to that date, public road transport services (freight and passenger) had by law the character of a 'public service', which required any nonstate provider to hold a 'concession' granted by the federal government. Through the concession system, the federal state had full discretion to give and take away authorization to operate vehicles. By basing entry into road transport services on the simple obtaining of a permit, the 1993 law effectively abandoned the public service character of road transport. Through the permit system, the federal state no longer has any discretion regarding authorization but rather must grant it obligatorily as long as the applicant meets the established requirements. Of greater potential economywide efficiency consequence, the change to nonconcessioned service has automatically transferred, through a constitutional mechanism, the main regulatory powers from the federal government to the respective local governments (states and municipalities) depending on the road the trucker is using.<sup>14</sup> This change has opened the potential for substantial differences in the extent of federal and state-level liberalization, with attendant costs to business arising from lack of harmonization.

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<sup>14</sup> For a more detailed analysis of these issues, see Sempe (1997) pp. 79-83.

**Changes in SCT's role.** The elimination of entry control and rate regulations greatly reduced the responsibilities and activities of SCT, particularly within the General Directorate of Land Transport and Tariffs. The remaining functions of SCT with respect to road transport include supervision of road maintenance, monitoring transport and formulating transport policy. SCT also assumed some new functions, such as supervision of highway safety. However, there was a long delay in reducing the number of personnel. Only by May 1994, did SCT significantly reduce the number personnel in departments previously involved in entry control and rate regulations. SCT assigned the remaining personnel in these departments to others. Reportedly, as the beneficial effects of the new policy have become evident and following the departure of certain SCT staff previously involved in regulatory matters, the commitment of SCT to the new policy has become very strong.<sup>15</sup>

**Deregulation at the federal level, affecting only interstate trucking.** Under the federalist system and the 1993 law, states have autonomy to regulate intrastate trucking. However, the federal government encouraged state governments to undertake similar deregulation within their own jurisdictions. SCT devised a plan for harmonising federal trucking regulations with state regulations through a series of bilateral agreements between the federal government and the states. These agreements were expected to be finalised by March 31, 1991.<sup>16</sup> Although some states, such as Chiapas, have deregulated intrastate trucking, the harmonization agreements have not been finalised yet. SCT recognises that the progress with bilateral agreements has been much slower than planned. SCT also has doubts regarding the legal authority of the Federal Competition Commission to eliminate intra-state tariffs, schedules and reserved routes. The continued lack of harmonization between federal and state-level regulations, if unaddressed, could lead to a bottom-up backtracking of regulatory reforms, affecting market power as well as environmental and safety objectives -- with the possible rebuilding of cartels at state level, and conflicting stringency requirements regarding environmental, safety and weights and dimensions standards.

**Postreform gradual adjustment—attempts to revive the cartel.** The former market intervention policies through segmentation and control of prices and quantities have left a strong imprint on postreform market conduct that has continued to manifest itself. Although regulation by government has been removed, there has been a natural tendency among previously favoured market participants to replace government control by interfirm agreements. The efforts of the Mexican Federal Competition Commission have played an important role to oppose anticompetitive practices and complement the deregulation goal of enhancing market contestability.

In 1994, the Mexican Federal Competition Commission carried out an ex officio investigation into an alleged absolute monopolistic practice by CANACAR. It involved an agreement among the Chamber's members to fix the prices applicable to their cargo transport services. The practice arose from a reference price guide for negotiations between users and truckers. CANACAR had written the guide and distributed it among its members. The

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<sup>15</sup> World Bank (1995), p.33.

<sup>16</sup> World Bank (1990), p.16.

document specifically established the aim of setting minimum prices for road transport services. This arrangement between competitors was found to constitute a violation of the competition law. As a result CANACAR was fined on its members' behalf. The Chamber also was ordered to withdraw from circulation those copies of the price guide already among its members; to refrain from issuing any other kind of guide with the aim of fixing prices or minimum costs for the services provided by its members; and to desist from establishing pricing policies aimed at creating minimum conditions for the hiring of road transport services.

Subsequently, CANACAR consulted the Commission regarding the development of a cost accounting program for its members. This program involved dissemination of a costing method, examples of its use, and training courses or meetings at the national level. To enable members to use the costing methodology more easily, CANACAR prepared a questionnaire for the use of each transport company to identify the elements that make up fixed and variable costs and to estimate the latter. The Commission decided that the use of this costing methodology could lead to greater efficiency in road transport operations – and was therefore not in itself a violation of the competition law. In this context, information on costs could direct transport companies' investments in more efficient units and assist towards a better organization of routes. The Commission did, however, take into consideration the precedent of CANACAR's prior price fixing activity. It therefore warned the Chamber that the example on how to use the methodology would have to be strictly illustrative in nature, avoiding at all times the possibility that the estimates it contained might serve to fix service prices. The Commission ruled that the material used to disseminate the costing method must indicate that the use of methodologies and estimates as ways to fix prices between competing road transport companies constitutes an absolute monopolistic practice and, as such, is sanctioned by the competition law.

As another example, in 1997 the Federal Competition Commission carried out an ex officio investigation on possible anticompetitive practices in the transport and distribution of diesel fuel. The investigation determined the existence of agreements (1) to divide markets into geographic zones for the purposes of transport and distribution and (2) to limit supply of transport services for fuel oil, in order to strengthen the ability to divide markets. The market division of transport services included two explicit agreements, with the allocation of explicit distribution concessions that acted as entry barriers. In one, transporters divided the transport to consumer enterprises of the product sold directly by *Pemex-Refinacion*, with the tacit initial acceptance of this parastatal enterprise. The other consisted of the division of transport services of hydrocarbon sold by two distribution companies,<sup>17</sup> with their consent and participation. The Commission declared the practices illegal, imposed dissuasive economic sanctions, and promoted conditions favouring competition, ordering the producer-distributors to assign routes in a transparent manner.

Regarding subsidies, some official entities have in the initial years following deregulation still rewarded affiliation to trucking chambers. For example, the National Bank for Public

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<sup>17</sup> The two companies were *Distribuidora de Combustoleo de Cd. Juarez* and *Distribuidora de Combustoleo*.



Works and Services (BANOBRAS, *Banco Nacional de Obras y Servicios Públicos*) reportedly required a letter from CANACAR to ensure the suitability of the trucking company as potential beneficiary for loans at subsidised rates in the early years following deregulation. Our empirical work corroborated that carriers who are not affiliated to trucking chambers—often small-owned operators—do not have either the information or the access to any available subsidised loans.

Without doubt, the continuing presence of trucking chambers has facilitated incumbents' control over service supply in some regions. Their contact network has continued to function as an instrument to distribute higher volume cargo among their members. Nevertheless, the forceful interventions of the competition agency, together with the development of formal freight forwarders has gradually eroded CANACAR's power, particularly in intermodal transport.

## 2.2 Regulations and related policy instruments

Road transport regulation was encompassed in the Law of General Communication Modes (*Ley de Vías Generales de Comunicación*) and its accompanying implementing regulation.<sup>18</sup> For road transport, this law was replaced on December 22, 1993 by the Law of Federal Roads, Bridges and Trucking (*Ley de Caminos, Puentes y Autotransporte Federal*), and supplemented on November 22, 1994 by the Regulation for Federal Cargo Trucking (*Reglamento para el Autotransporte Federal de Carga*).<sup>19</sup>

### 2.2.1 The preregulatory reform environment

**Market access.** Federal policy strictly controlled entry. Entry regulation differed for *public for-hire* trucking companies and for *private own-account* trucking fleets that are owned and operated by firms in other industries primarily for their own purposes. Main restrictions were on entry to operate on federal highways, on cargo movement between established corridors, on cargo assignments, on container handling, and on the handling of cargo at railroad stations and international borders:

- Mandatory concessions based on agreement from incumbents. To provide public general freight services, truckers were required to obtain a federal trucking concession from SCT. Concessions were specific to class of service, route, number of haulage units that can be used, and technical characteristics. By law, the concessions granted to any individual could not be for the operation of more than five vehicles. Company affiliation for a concession holder was compulsory. If an individual was granted such a concession for general freight, he still had to be accepted by an established company and this constituted an impassable barrier to entry. The administrative procedures for determining the need for additional service depended on the opinion of existing service providers. Incumbent firms had both preferential treatment whenever it was necessary

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<sup>18</sup> *Reglamento al Capítulo de Explotación de Caminos y de la Ley de Vías Generales de Comunicación*. For a detailed analysis of this regulation, see Davila Capellaja (1994).

<sup>19</sup> Dates reflect publication in the official gazette (*Diario Oficial de la Federación*).

to increase the number of trucks and the right to object to future increases in installed capacity. These procedures strengthened the position of existing firms and led to the formation of cartels.

- Reserved routes. The country was divided into eleven corridors and each trucker needed a concession to operate within a specific corridor. By being route-specific, the concession system controlled installed capacity for each corridor, creating a ceiling to ton-kilometres per route. The corridor system favoured existing spatial concentration since the corridors tended to radiate from Mexico City. Down-time was high and load factors low as the restrictions constrained their options for back-hauling and made it more difficult to match their supply with available demand. For shippers requiring cross-corridor shipments or requiring services beyond the established route capacity, special arrangements with higher tariffs permitting the use of trucks allocated to other routes had to be made. This segmentation was critical to prevent market forces from generating more competition.
- All traffic through freight centers. Truckers must load and unload cargo at specified freight centers (*centrales de carga*) and shippers must channel requests through these centers. While originally motivated by economies in provision of common services (such as provision of spare parts, insurance and paperwork), many freight centers began limiting entry and forming cartels in the assignment of cargo. Moreover, freight centers were increasingly reluctant to grant return-load facilities to other centers even on the same route, and opposed allowing vehicles from other routes to operate within their service area even when transport was in short supply. Centers at ports or border zones were even more restrictive because cargo could be easily centralised and controlled.
- Monopoly provision of international container movements. Multimodal, a semipublic company granted monopoly status for the handling of international container traffic, was created by SCT in 1981 – with the exclusive right to provide door-to-door multimodal services. Collusion between Multimodal and the freight centers led to a system of surcharges and unofficial payments which often far exceeded the stated tariffs. Service standards were low and deliveries often delayed, resulting in a tendency for container traffic to be confined to port areas (and thereby foregoing the benefits of door-to-door delivery). In addition, customs regulations did not permit import-bearing containers that were temporarily brought into the country to transport domestic cargoes, resulting in empty outbound movement of containers.
- Limited licenses for cargo handling. SCT granted concessions for handling cargo movements at railroad stations and border customs facilities as well as for the drayage services to cross the border. In most cases, goods could not be moved without the services of the concessionaire. As with other concessions, entry was limited and cartels were formed.

For private own-account carriers, permission was required to haul their own goods. Private fleets could not compete for back-haul and more broadly were not allowed to transport third-party cargo, again segmentation to prevent competition but in practice leading to sizeable unused capacity in the system. Eventually, a temporal permit allowed private truckers to offer

their services when public companies' supply was insufficient. However, private truckers were sanctioned with the loss of the truck if they offered the service without acquiring the permit.

Companies that offer specialised freight services were regulated under separate rules. Specialised freight services included haulage of hazardous materials, objects of high volume or great weight, securities, industrial cranes and cars direct from the factory. These carriers required a different permission, but then could haul on all the federal roads. However, they could only operate the registered specialised trucks and transport a restricted number of specific cargoes (a subset of animals, perishable food, bottled liquids, construction and electrical material, furniture, automobiles).

With respect to international competition, though cargo trailers were allowed to cross international borders and proceed to their final destination, the tractors (power units) were not permitted to cross borders, neither by Mexico nor by the United States. Drayage services have developed to undertake the exchange of power units at the border. The regulations for these services vary depending on the cities and states involved on both sides. In most cases the Mexican drayage firms are allowed to bring and take trailers across the U.S. border within a commercial zone limited to the urban area at the border. The U.S. drayage operations are generally more restricted as a result of Mexican regulations, at times not permitting border crossing nor the pick-up of return loads.<sup>20</sup> An additional difficulty has been that the high-growth in-bond assembly (*maquiladora*) industries have not been permitted to transport their own products in their own private fleets. Finally, foreign carriers were prohibited from owning Mexican trucking companies.

In addition to federal regulations that affect interstate traffic, some states have restrictions that affect intrastate movement of cargo. In some cases, concessions are required for specific cargo and/or route movements on state highways. A review of state regulations in Chihuahua, Jalisco, Puebla, Veracruz and the state of Mexico has indicated that state regulations have not, in general, posed major issues as exclusive intrastate traffic is not very significant in comparison to interstate transport. Nevertheless, state regulations have been found to affect the movement of some agriculture, forestry and construction industry products.<sup>21</sup>

**Market conduct.** The cartel-like behavior stimulated by tight entry restrictions profoundly affected market conduct. Trucking companies especially small operators that offered similar services and loaded freight in similar locations were compelled to establish societies (*lineas de concesionarios*) and offer their services through freight centers. Some freight centers (like the ones in Mexico City and Guadalajara) reportedly restrained themselves to leasing spots to trucking firms that had direct contact with their clients, stamping the loading documentation (*talones de embarque*) and promoting with the authorities sanctions against those who offered the service without legal allowance. Other centers (like those in Matamoros, Veracruz and Tampico) acted as inescapable intermediaries between truckers and shippers, preventing direct

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<sup>20</sup> For a detailed account of truck-related border crossing problems, their persistence after regulatory reforms and their associated high transactions and congestion costs, see Giermanski (1995).

<sup>21</sup> See World Bank (1990), p.14.

negotiation between carriers and shippers. They determined who carries a shipper's load, destroying carriers' incentives to build up reputation. Some freight centers compelled truckers to follow a roll call, first-come first-serve queuing system when loading freight.

The fixed terms dictated by the freight center for the provision of the loading and delivery service were extremely generous: loading, one day; each 200 kilometres-segment transport, one day; unloading, one day. The sanctions for delays were restrained to partial losses of the rate, which favoured trucking companies: from 1 to 5 days, 5 percent; from 5 to 10 days, 15 percent, more than 10 days, 30 percent. This created incentives for excessively long delivery times, enabling the vehicle to wait a substantial time in order to find a return-load and not need to return empty. Thus, a trip from Mexico to the nearby city of Cuernavaca (a roughly 60-minute trip by car) could take 8 days with the shipper being required to pay 95 percent of the prescribed tariff. On the other hand, shippers who did not pick up their freight within the first 48 hours after cargo arrival to the destination had to pay warehousing charges.<sup>22</sup>

Important additional regulations or the lack of appropriate regulations affected vehicle maintenance and loading practices, vehicle fleet purchasing practices, as well as related safety and environmental practices. Main areas included:

- Absence of dimension and weight regulations. Mexico lacked any regulation controlling vehicle weight and size. Axle overloading (excessive weight per axle) was suspected to be most serious on roads connecting major port areas, where cargoes are concentrated and heavy industries are located. Overloaded axles cause severe damage to highway pavements and bridges, which in turn increases the risk of accidents, limits road life and raises maintenance costs.
- Absence of technical vehicle safety regulations. Mexico also lacked an inspection system to monitor vehicle safety. The present system allows potentially dangerous vehicles to use the public roads. At least 7 percent of accidents are due to vehicle factors such as bad tires and brakes. The proportion of number of persons killed on Mexican highways to the number of accidents was six times higher in Mexico than in Sweden.<sup>23</sup>
- Fleet purchase restrictions. The automotive industry, consisting of auto, truck, bus and parts producers faced numerous restrictions which greatly increased the effective costs of vehicle purchase and maintenance. For automotive production, the effective protection in 1989 was estimated at about 50 percent compared with a 15 percent average for manufacturing as a whole. In addition, imports of tractors and trailers were prohibited.
- Absence of environmental regulations. Mexico lacked any norms controlling truck noise and air pollution. There were also only minimal programs in place affecting the quality of fuels.
- Exemption from taxation. The Mexican transport sector was exempt from income taxes as well as value added and ownership taxes. Instead, since 1966, truckers were required

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<sup>22</sup> This account is based on Davila (1994), p.129.

<sup>23</sup> The latter is based on a rough estimate by World Bank staff. See World Bank (1990), p.17-8.

to pay a direct tax that was a fixed amount per operated vehicle. The amount varied according to the type of vehicle and service rendered, but was very small. The exclusion provided a significant avenue for tax evasion since a manufacturer could start a trucking operation to escape corporate income taxes.

**Prices.** Fixed prices for routes. Official trucking tariffs were set by SCT, presumably above the competitive level and high enough to balance, on average, both fixed and variable costs and yield “reasonable” profits. The rate was uniform for all seasons and for all regions of the country. The rates were classified in five different categories, each with its own variable factor per ton-kilometre. However all the categories shared the same fixed factor per ton. The classification complied loosely with the difficulty of handling different products, and it discriminated between the value of the goods. Trucking companies provided the cost information that the authorities evaluated and used as a reference for setting rates, but rates often bore little or no relationship with the costs of a specific shipment. Concessionaires were not allowed to charge prices above or under the authorised rates.<sup>24</sup> Neither could private truckers charge over or under the official rates when meeting extraordinary demand for the service.<sup>25</sup> Additional application rates set values for other services such as pick-up delivery, exclusively served customers, empty back-hauls and warehouse spaces.

Insurance liability limitations for carriers. Trucking companies’ responsibilities for damaged or missing freight were uniformly established for all the different kinds of cargo and were explicitly limited to very reduced quantities, unless the shipper paid an additional fee in proportion to the declared value of the good. The government had fixed the ceiling on the trucker’s responsibility for cargo loss or damage to only US\$0.31/ton. A further regulation prevented negotiation of incremental insurance by fixing the rate at which the shipper could insure his cargo irrespective of the product-specific shipping risks (at 3 mills per declared value).

Non cost-reflective tariffs. While overall road costs were being recovered, there were important cross-subsidies between automobiles and trucks. By 1989, trucks were only paying for a small fraction, roughly 15 percent, of the costs that they caused to the highway network. This was essentially due to the relatively low Mexican price of diesel fuel, which in late 1989 was roughly US\$0.65/gallon, insufficient to allow adequate cost recovery, coupled with the absence of significant license fees or direct taxes levied on truckers.<sup>26</sup>

### *2.2.2 Regulatory reform*

**Market access.** The basis of the deregulation program was that private investment and competition in trucking would be encouraged and the development of multimodal transportation would be pursued. The new access regulations included:

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<sup>24</sup> Some specific products such as corn, wheat, rice, sorghum, sugar, salt, cement, coarse sand, gravel, sulfur, coal, raw oil and gasoline were subject to an 8% discount that functioned as a cross subsidy.

<sup>25</sup> See Dávila (1994), pp. 127-128

<sup>26</sup> World Bank (1990), p.19.

- Free entry into trucking with a simple permit. Any trucker wishing to operate one or more trucks need only prove his identity and vehicle ownership to get a federal trucking permit. The changes abolished both limits on the number of concessions and on the partnership of incumbent trucking companies in the allocation process of new concessions. Specialised trucking firms are treated equally, allowed to transport any cargo whenever their trucks were technically suited for doing so. Private own-account operators are allowed to transport third-party cargo. All restrictions on backhaul are eliminated.
- Free entry on all routes. Trucks have been freed to offer their services and transport interstate cargo throughout Mexico. Direct shipments between former corridors are permitted without additional costs.
- Traffic can flow independently of freight terminals. Truckers do not have to belong to freight centers to obtain cargo and shippers are free to use the trucker of their choice. Freight centers no longer control cargo shipments nor certify the bill of lading.
- Free entry into container handling. Entry into the provision of multimodal services has been opened up and containers can be transported without Multimodal's services. In January 1990, customs regulation restrictions on the use of international containers for the transport of domestic cargo were lifted.
- Free entry into cargo handling. In January 1990, new regulations forbid giving exclusive rights for the provision of cargo handling services in federal areas, specifically at railroad stations, customs facilities and border crossings (drayage services). Any operator with a federal trucking permit is automatically allowed to provide such services.

The current Regulation for Federal Cargo Trucking establishes the following requirements to obtain a permit: (1) fulfil the registration form that SCT issues (what it must include or maximum permissible items to include are not specified in the Regulation); (2) show evidence of third-party damages insurance; (3) declare the vehicle characteristics; and (4) show the certificate of low pollution emissions. For the case of incorporated legal entities (*personas morales*), the regulation also requires them to show the constitutive deed (*escritura constitutiva*) which establishes trucking service as their main activity (Arts. 7 and 9). The authorities' response to the application must not exceed thirty days (Art. 15).

With respect to international competition, foreign carriers are still not permitted to make use of federal roads for international transport. NAFTA established a schedule of liberalization of the transportation sector in three, five and ten years. However, integration of systems between the United States and Mexico has been slowed by a U.S. unilateral decision to postpone NAFTA in trucking.<sup>27</sup> Foreign carriers are not allowed to own Mexican trucking companies until 2004. One positive development is that January 1990 changes have permitted the *maquiladoras* to transport their own products in their own trucks across the border.

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<sup>27</sup> Based on arguments of divergent coordination in standards, lack of security in Mexican main highways and low technology of Mexican carriers. See Ibarra-Yunez (1999), p.6.

Although the federal government developed a plan of action for federal-state harmonization of trucking regulation, the federal government has no jurisdiction over exclusive intrastate transport on state or local roads.

**Market conduct.** Deregulation eliminated all restrictions on routes. It defined a new unitary route for public trucking that embodied all the roads of federal jurisdiction. Since it is no longer mandatory to contact clients through freight terminals, shippers have direct contact with their preferred trucking company and can make their choices on the basis of quality and price differences. Other regulatory changes include:

- Liberal dimension and weight regulations. Mexico introduced very liberal vehicle weight limits.<sup>28</sup> Among the consequences are that Mexican roads need to be constructed at higher standards and costs than U.S. roads. In turn, Mexican vehicle operating costs per unit of cargo are much lower as the higher road costs are not recovered in road user charges. On the other hand, regarding vehicle length limitations, Mexican standards are typically more restrictive than U.S. ones. In particular, Mexican standards do not allow the haulage of 51 feet trailers, the most common U.S. size. In practice, the size and weight limits are rarely enforced, due to the absence of sufficient platform-scales. An insufficient number of inspectors also lack mobile units and there is a reported lack of scales to enforce the weight regulations. This is an area where the authorities and trucking representatives of both countries are still negotiating to reach a mutually acceptable agreement, under the guise of the post-implementation negotiations of NAFTA. If Mexican trucks are allowed to operate up to their own weight limit, Mexican operators would be at an advantage over U.S. operators and rail transport. On the other hand, if U.S. standards are adopted, Mexican operators will be disadvantaged as their vehicles are designed to carry much higher loads and therefore have higher unit operating costs.
- Liberalization of fleet purchases. The regulations governing the automotive industry were changed to ensure that truckers are able to purchase units of international quality at international prices. Starting with model year 1991, the import of tractor-trailers was allowed if domestic prices exceed the international level, and for 1992 also heavy trucks. In addition, restrictive regulations on the organization of truck production, such as national integration requirements, compulsory incorporation of domestic components into vehicles and the majority national ownership requirement have been eliminated. The privatization of the national truck producer DINA in the early 1990s and the market entry of aggressive truck producers like Mercedes and Volvo with financial lending leverage was critical.
- Level-playing field taxation. Within the 1990 budget approved by Congress, the exemption of the trucking industry from income, value added and ownership taxes was eliminated.

**Prices.** The reform abolished official rates. The current regulation explicitly establishes that truckers must freely determine rates (Art. 65). These amendments fostered quality differentiation of the service, as rates reflecting differing quality were now freely negotiable

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<sup>28</sup> See World Bank (1994), Table 3.2, p.67.

directly between trucking service providers and users. As a complement, to protect shippers from cargo loss or damage, the regulation establishes that trucking companies will pay the equivalent to the declared value by the shipper (Art. 84). On December 1, 1989, the price of diesel was increased by 5.6 percent and this increased cost recovery to the highway network from trucks from roughly 15 to 50 percent.

### 3. Market Structure and Entry

#### 3.1 Evolution of industry structure

**A dramatic increase in haulage units.** Between 1989 and 1996, the number of haulage units increased from 164,010 to 315,318 (a 92 percent increase, or 13 percent per year, significantly higher than the economy average growth rate). The most striking increase was between 1989 and 1992, precisely concurrent with the regulatory reform period. As shown in figure 1, the total number of haulage units increased most dramatically between 1989 and 1990, by 36 percent, and by another 24 percent between 1990 and 1991. By the end of 1991, available capacity was more than 60 percent higher than in 1989. The total increase between 1989 and 1992 was of 85 percent (growth from 1989 to 1994 was 91%).<sup>29</sup> What is also striking from figure 1 is that in spite of the 6.8 percentage fall in number of registered haulage units between 1993 and 1994, the number of units in 1996 had again surpassed 1993 levels, suggesting a relatively minor consolidation to date.

This dramatic increase can be explained by: (1) the entry of new firms; (2) the expansion of existing firms through acquisition of new haulage units; and (3) the legal registration of a number of formerly nonregistered firms (the *transportistas piratas*). As could be expected, the rigid regulatory restrictions not only stimulated collusion among formal truckers but simultaneously led to the development of a substantial informal trucking sector. This sector was comprised of small-owned operators (*transportistas piratas*) who avoided all legal constraints. Even though informal truckers could not take advantage of scale economies, they avoided indirect costs, did not pay taxes nor any other required fees. The *transportistas piratas* did not have offices or any other kind of administrative costs, and they secured their freight through informal freight forwarders (*coyotes*).<sup>30</sup> As a result of easing entry barriers, many informal carriers decided on their own to register with SCT and avoid the risks and costs of operating illegally.

In order to assess the extent of new entry as opposed to relabelling of existing trucks from informal to formal status, it is important to examine the numbers in greater detail. By the end of August 1990, a total of 50,694 federal road permits for freight transport had been issued. Of this total, 30,153 (60%) were for new entrants, 13,830 (27%) for previously illegal operators,

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<sup>29</sup> In addition to being driven by the dynamics of regulatory reform, a portion of this increase may also be related to the prospect of NAFTA, even though in the early years its subsequent passage was far from taken for granted.

<sup>30</sup> Even though one of the main outcomes of trucking deregulation was the inclusion of most of the informal truckers, some still subsist to avoid remaining regulations including taxation.



and the remainder (13%) for expansion of existing fleets.<sup>31</sup> Based on this evidence, the most important group accounting for the increase was new entrants, suggesting that the amount of competition among truckers may have increased substantially.

The combination of lower tariffs and improved service reportedly has induced some agricultural and industrial producers to give up their own in-house truck fleets. They now outsource and contract their transport services from public providers. It is the elimination of some of these private fleets which has provided a significant portion of the physical vehicles for the expansion of the public for-hire fleet.<sup>32</sup>

**A preponderance of small owner-operators.** Under the preregulatory reform period, in theory there were no large companies since no individual could be granted more than five vehicle franchises. In practice, however, some individuals controlled up to 500 vehicles through nominees. In any case, prereform official data was therefore not particularly meaningful. By 1996, the 315,318 haulage units were divided among 60,531 registered firms. Of this total number of firms, 90 percent were owner-operators (between 1-5 trucks), 8.3 percent were small firms (6-30 trucks), 2 percent were medium firms (31-100 trucks) and a further 3 percent were large firms (plus 100 trucks). Both the large number of owner-operators (54,292) as well as the relatively small number of large firms (187) are striking, as highlighted in figure 2. Of course, in terms of number of haulage units controlled by each size class, the large firm category becomes more significant, with almost 10 percent of units (9%).

**A dual segmented structure of technologically more advanced, concentrated large firms and low-technology, small fringe firms.** Although large firms are relatively small in numbers, with 187 in 1996 (up from 148 in 1988), their market and contracting access and greater technological sophistication has reportedly maintained the system as a relatively concentrated, dominant firm market structure. In 1994, the large firms with more than 100 trucks represented 65 percent of national haulage and 87 percent of transborder transport.<sup>33</sup> The large firms provide services based on long-term contracts and cover main routes, while owner-operators and small firms cover short hauls, urban markets and cargo consolidation. Tentative evidence of the degree of segmentation is provided by evidence that: (1) large manufacturing clients of trucking firms generally do not use fringe carriers or subcontractors in case of nonanticipated demand; (2) large trucking companies generally do not consider lower prices of fringe companies as a signal of price competition; and (3) reputation, differentiation of service and quality are present in large trucking firms and not evident in the residual short haul carriers.<sup>34</sup>

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<sup>31</sup> World Bank (1995), p.29. 'Previously illegal operators' are those that indicated start dates prior to July 1989 but that were not previously registered; reporting was likely to be truthful as there were no ex post sanctions for such prior illegal activities though the number in this category may have been substantially larger, at the expense of the 'new entrants' category.

<sup>32</sup> World Bank (1994), p. 9.

<sup>33</sup> As reported by Ibarra-Yunez (1999), p.7.

<sup>34</sup> Based on a survey of 13 leading trucking carriers (accounting for 26% of total road freight transportation) and 25 manufacturing producers users of trucking services in Northeastern Mexico in 1993 and updated in 1995. Out of the 25 industrial users, 18 did not use fringe carriers in case of non-anticipated demand, and

In response to the continuing foreign ownership restrictions, non-Mexican companies have to hire the services of domestic carriers who haul the trailers within Mexico. These regulations have fostered formal agreements and alliance between U.S. carriers and the larger Mexican trucking companies. Some of them prefer exclusive partnership arrangements (for example J.B. Hunt of U.S. has a partnership arrangement with TMM of Mexico) while others develop a network of cooperative ventures (such as Contract Freighters Inc. that works with more than 20 Mexican companies).<sup>35</sup>

**A relative scarcity of trailers.** Another structural feature of the Mexican industry is the scarcity of trailers relative to motor units (both two and three-axle tractors and integrated trucks). While U.S. motor carriers typically operate 1.5 to 2 trailers for every motor unit, in Mexico, the ratio was 0.3 in 1989, rising to 0.5 trailers per motor unit by 1996 (figure 1). The obvious result for U.S.-Mexico trade is an overreliance on U.S. equipment in cross-border traffic. Put another way, the thousands of U.S. trailers operating in Mexico are there by necessity.<sup>36</sup> This point is related to the fact that Mexican truckers are undercapitalised and they thus take every opportunity to operate without further capital outlays. In this context, it is interesting to note the increase in capital expenditures between 1989 and 1995 that underlies the rise in trailer to motor unit ratio over that period.

### *3.2 Industry conduct and intensity of competition*

**Prereform low-quality equilibrium.** As a result of the rigid prereform system, informal truckers found a market segment that was willing to take some risks in order to pay lower rates. It therefore appears that even under extensive regulation, the low-end of the Mexican market had a certain degree of competition, with illegal operators offering bargain prices. The biggest impact of the regulatory regime appears to have been in limiting the supply of higher-quality logistics services. For shippers that required better and faster service, it apparently could be obtained at a negotiated higher-than-official price. But even a larger trucking company could in general not position itself to consistently provide such a service due to peer monitoring and due to the impersonal system for matching loads and truckers. Consequently, no one invested significantly to improve quality, though there appears to have been some improvisation to provide better quality service when paid to do so.

The freight center system and CANACAR's intervention usually prevented shippers and carriers from developing long-term relationships where reputation and quality of service matters. As illustrated in figure 3, under regulation Mexico had a limited range of quality available, compared to the United States. Also note that rigorously enforced U.S. technical regulations would not have allowed Mexican-style low-quality trucking operations in any case.

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none of the 13 carriers used fringe company pricing as relevant to their own pricing decisions. See Ibarra-Yunez (1999).

<sup>35</sup> *Supply Chain Directions for New North America*, 1995. In addition to TMM-JB Hunt, other reported alliances include Celadon-Grupo Hermes, Carolina Freight Corp.-Tresguerras and Yellow Freight-Transportes Sierra; see Ibarra-Yunez (1999), p.7.

<sup>36</sup> ATA (1995).

**Increased intensity of competition.** Two types of measures reflecting changes in intensity of competition were explored in the enterprise survey. A first question asked carriers to quantify for 1989 and 1997 the number of direct competitors who have or may have a significant impact on their business, asking them to report only the number of competitors who can take away significant chunks of business or from whom they can take away significant amounts of business. According to this measure, intensity of competition has increased significantly across the board, with carriers on average reporting an increase of roughly 50 percent in number of such direct competitors. Intensity of competition has increased much more starkly for smaller firms (less than 30 trucks), who report an increase of over 85 percent, in contrast to large firms who report an increase of under 20 percent.

A second question asked carriers to qualitatively rank five different classes of competitors (small owner-operators, large for-hire, private, affiliates of foreign carriers, other transport modes) according to intensity of competitive threat for their operations, both in 1989 and 1997. On average across all carriers, increases in competitive pressure were reported as coming from all classes of competitors. In terms of absolute levels for 1997, both small and large carriers report that the largest competitive threat comes from large operators, followed by competition from affiliates of foreign carriers. Interestingly, in terms of changes between 1989 and 1997, the largest number of carriers reported increases in intensity of competitive threat coming from affiliates of foreign carriers. Both small and large firms report this finding. Small firms then report that the second most important increase comes from large operators, while large firms feel a stronger change in pressure from other transport modes. Only a minority number of carriers reported increases in intensity of competitive pressure from private carriers or from small owner-operators.

After deregulation, prices for the existing quality of logistics services have fallen by at least 30 percent.<sup>37</sup> Moreover, the NAFTA agreement has allowed large retailers and manufacturers to adopt faster and more complicated logistics systems, forcing truckers to improve their services. This process is also helped along by U.S. truckers' interest to form alliances with Mexican truckers. Some U.S. firms work with different Mexican firms with only a formal agreement for trailer haulage. However, through a few more intensive alliances, some U.S. truckers are transferring know-how, computer software, and equipment. As a result, higher quality trucking services are now available in Mexico. However, these services are offered by only a handful companies and therefore are quite expensive (only about 10 Mexican carriers own more than 500 vehicles). Consequently, the price-quality profile of Mexican trucking changed substantially (see figure 3).

#### **4. Performance**

The following analysis considers the impact of regulatory reform in road freight on industry-specific and broader economywide performance. Although it is always difficult to isolate the impact of policy from other changes in the economic environment, attempting to

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<sup>37</sup> Our surveys confirmed this widely believed figure.

quantify the importance of a specific set of policy changes is even more problematic during a time when so much else was changing simultaneously – including concomitant regulatory changes in related sectors, a drastic trade opening with Mexico's most significant trade partners, important related tax changes, and a severe economic downturn in 1995. In assessing downstream impact, therefore, we focus on the more modest objective of quantifying the maximum benefits for selected downstream users from key road freight logistics innovations. More generally, the detailed findings from the survey of both carriers and shippers supplement where possible and corroborate the trends in the official statistics.

#### *4.1 Impact of reform on performance in the road freight industry*

##### *4.1.1 Output and prices*

**Significant increases in output levels.** Between 1989 and 1995 the traffic volumes in ton-km of domestic public road freight transport increased by 52 percent, from 107,243 to 162,827 million ton-kilometres. The average annual increase per year since reforms began, at 8.6 percent per year is more than double that during the 1980-89 prereform period (3.4% per year). Interestingly, the average distance carried increased by almost 30 percent, from 346 to 444 km, after having been roughly constant for the previous nine years since 1980. A similar picture arises based on the volume of freight hauled. Between 1989 and 1995, there was an 18 percent increase in domestic road freight transported, from 309.8 to 366.7 million tons. The average annual increase since reforms began, at 3 percent, again is greater than during the prereform period (at 2.5% per year).<sup>38</sup> In comparing these two series of output-related statistics, what is interesting to note is that although both increased significantly more during the postreform period, distances travelled increased substantially more than volumes carried, in effect longer trips to new and further locations.

The survey data collected corroborates this significant increase in road freight haulage volumes since 1989. Of incumbent trucking firms reporting data for both 1989 and 1997, total annual kilometres hauled increased by roughly 60 percent. This increase masks important changes at the individual trucking company level, with some firms more than doubling distances covered, while two of the smaller firms decreased distances covered.

A complementary indicator for freight haulage volume is changes in the number of trucks by firm. These figures show a clear redefinition of the market structure, with the growth of freight haulage volumes in the period mainly attributed to larger firms:

- The average growth rate for trucking firms expanding their fleet was 125 percent: 9 out of 14 (64%) reported an increase in their fleet;
- The average growth rate for large firms was 175 percent: 7 out of 8 large firms reported an increase in the number of trucks, while only 1 reported a decrease;

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<sup>38</sup> See IMT (1997), Tables 4.1.1-2.

- The average growth rate for small firms was 69 percent: 3 out of 6 small firms reported no changes in the number of trucks, only 2 of them reported an increase and 1 reported a reduction.

The number of states in which a firm has sizeable operations (deriving at least 4 percent of its total income in terms of inter and intrastate traffic) may be a useful proxy for output mix, reflecting the transport of either existing or new products to new locations. According to this definition, trucking firms in the sample were active in between one and ten states, typically in two to five states. Based on this indicator, it appears that regulatory reform and liberalization of routes was associated with a broader range of services offered. The largest number of respondents reported an increase in the states that account for an important portion of their operations, with 5 out of these 6 firms being in the larger size grouping. Some of these expanding firms more than doubled the number of states accounting for sizeable operations, from four to eight, or from one to seven. The expansion in geographical area of operation is generally associated with the opening of one or more additional terminals or bases of operation. However, the fact that Mexico has 31 states and that the largest firm interviewed operates in only 10 of these suggests scope for continued consolidation of routes.

**Prices fall overall, but fastest in lower quality-of-service segments.** Rate analysts in SCT found that between 1987 and 1994 trucking rates nationwide declined 23 percent in real terms. One official in SCT estimated that general cargo trucking cargo rates in 1994 on the major route between Laredo and Mexico City were about 30 percent lower in real terms than the prevailing rates in 1987.<sup>39</sup> Another study concludes that while there is only incidental and anecdotal evidence on changes in truck tariffs, all the evidence points to reduction of the order of 25 percent in real terms.<sup>40</sup>

The substantial reduction in overall tariff levels documented in available nationwide studies is corroborated by survey results. Almost all downstream users of trucking services interviewed reported that the cost of hiring a truck had fallen in real terms since 1989. Estimates of the size of the decline generally ranged between 5 and 15 percent. More careful probing of additional exogenous factors confirm that there have been significant declines in real prices of a given service delivered, though the magnitude of the price change is difficult to quantify given the variations in the actual service provided. For instance, one shipper estimated that an additional 20 percent price fall for the originally available service should be attributed to the higher quality levels now available, including newer trucks, faster delivery, and more reliable shipping facilitated by more sophisticated tracking systems. Another shipper estimated that the price fall would have been even more substantial if it did not incorporate the effect of new toll roads, which he estimated added 6 percent to the cost of a typical trip.

Regarding rate structure, there appears to have been an important differentiation of prices to reflect differentiation of services provided to distinct classes of users. Customers who ship high value-to-weight components where timeliness and reliability of delivery are critical are

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<sup>39</sup> World Bank (1995), p.29.

<sup>40</sup> World Bank (1994), p.8.

willing to pay substantially more for higher quality service. For such shippers, the logistics cost generally represents less than 10 percent of the product price. These services are generally provided by the larger, more sophisticated carriers. These prices do not appear to have come down as much, no doubt reflecting the increased quality elements embedded in the price and the relatively less intensive competition prevalent between the larger, technologically most sophisticated trucking fleets. On the other hand, customers who ship high volume, high weight products where the logistics cost is substantial generally seek to minimise transportation costs. These lower quality services tend to be provided relatively more by the small owner-operators. These are the prices that have come down most substantially.

#### *4.1.2 Innovations and productivity*

**Large trucking firms adopt innovations.** Based on survey results, a substantial amount of innovation in the industry has taken place with almost all significant ‘better practice’ logistics improvements introduced only after 1990. Importantly, the more sophisticated technological innovations have been almost exclusively adopted by the larger firms. All large trucking companies have modernised their fleet, with almost all buying new trucks with electronic combustion systems to minimise the use of fuel. Of firms adopting a standardised process for the purchase, maintenance and resale of trucks, over 80 percent were larger carriers. Most large companies also have taken advantage of computer systems to improve administrative controls and to upgrade their communications systems with customers through internet use. All large companies significantly modernised their freight tracking systems to ensure timely delivery, with a majority investing in modern satellite or cellular-based communications systems to institute some kind of tracking system. Note that a number of large truckers have U.S. based partners who urged them to introduce these innovations.

Innovations introduced by large trucking companies since 1989 include:

Technological truck-related innovations (e.g., new trucks with electronic combustion systems)	7 out of 8 (plus 1 in next 2 years)
Improved computer systems and administrative controls	7 out of 8
Improved tracking systems	6 out of 8 (plus 2)
Improved facilities	3 out of 8
Internet	3 out of 8
Human resources training	2 out of 8 (plus 2)
ISO-9000 <sup>41</sup>	1 out of 8 (plus 2)
Driver teams <sup>42</sup>	1 out of 8

Of firms realigning their routes along a reported ‘modern hub and spoke system’, again over 80 percent were larger carriers – such systems were typically introduced in 1993, 1994, 1996 and 1997. It is important to clarify that because most of the distances can be reached in less than 24 hours, the hub and spoke system as it works in the United States does not really

<sup>41</sup> Truckers identified the ISO-9000 certification as an efficient way to gain contracts with U.S. trucking firms. Thus, this innovation could better be identified as an answer to trade opening.

<sup>42</sup> Trucking companies believe that to maximize the life of the trucks it is better to assign the truck to one driver, who can be held responsible for it. They also mentioned that some drivers do not like to share their trucks with other drivers. These are the reasons why driver teams are not considered very useful.

exist in Mexico. Based on the survey results, large firms generally focus on a few main routes instead of having a wide national coverage. The trucking firm with the highest coverage, for instance, provides road haulage services only in ten of the 31 states in the country. Large firms try to maximise their market share in the most profitable routes (e.g., Mexico City-Laredo, Mexico City-Guadalajara). What larger firms reportedly do is maintain loading and unloading terminals in the main cities, and switch from larger long-distance to smaller trucks to haul the trailers within the city. In this way, whenever a driver arrives to a city he can switch trailers and continue working. There is no need to spend additional time in loading or unloading, and the trucking companies do not have to plan their trips in accordance with clients' working hours. Generally, the trucks used for deliveries in the city have a higher average age.

According to a relevant industry study,<sup>43</sup> the three leading LTL (less-than truck load) U.S. carriers now have full-time Mexican partners. On the urging of their U.S. partners, these LTL carriers adopted U.S. style management and operation procedures. This may partly be due to the fact that LTL was unheard of in Mexico before NAFTA and therefore U.S. firms had the opportunity to set up systems from scratch. Now LTL delivery standards are almost on par with those of the U.S., except that the Mexican LTL carriers do not have a large number of pick-up and delivery points which limits their volume, and they currently do not expect a big change in volume to enlarge their networks.

Based on qualitative feedback during surveys, the incentives to introduce innovations for larger firms come from the dual imperatives under the new environment both to minimise costs in order to raise profits and to improve service quality in order to gain new clients. As evidenced by the relatively low trailer to tractor ratios, Mexican truckers, especially the small ones, are undercapitalised. Following the economic crisis of 1994, most of them could not modernise or expand their fleets. This provided larger firms ample opportunities to invest to increase their market share. Larger trucking firms are reportedly also conscious that rail privatization will increase competition in the sector. Thus, the improvements in quality are motivated by a desire to differentiate their service from both small trucking companies and rail carriers.

**Small trucking firms struggle to survive.** The contrast with small firms is extremely stark. Some reportedly have introduced no innovations whatsoever since 1989, while others have only been able to limit innovations to radio communications or limited improvements in office equipment.<sup>44</sup> Only two out of the six small firms interviewed have been able to invest in fleet modernization and computer systems. Their planned innovations are more modest in scope, limited to modernization of existing equipment:

- Only 3 out of 6 small firms introduced or were planning to introduce technology innovations in the next two years.

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<sup>43</sup> *Supply Chain Directions for New North America*, 1995

<sup>44</sup> This finding of low or no investment in technological upgrading by smaller firms is consistent with the findings of an earlier survey by Ibarra-Yunez (1999), where he concludes "reputation, differentiation of service or quality were not evidenced by the survey from the residual carriers of short hauls" (p.21).

- Small firms are more concerned to meet adequate spending levels for trucks' maintenance (3 out of 6). A few of them have trucks that cannot be used because they do not have the financial resources to afford the repairs. During the crises years they used old trucks to provide parts for the newer trucks.
- A limited number have targeted improvement of the most basic administrative controls (3 out of 6).
- One company was about to close because it faced stiffer competition that it could not meet, and it could not recover from the economic crisis.
- Only one out of six interviewed was undertaking a serious effort to update the fleet, invest in computer systems and facilities.

In general, small trucking companies do not have direct contact with their clients. They deal with freight forwarders (formal and informal) or larger trucking firms, and provide the service within a region. When they were asked how sector deregulation impacted on innovations, 2 out of 6 answered that higher competition in prices due to deregulation impeded the introduction of innovations. In the last years they have been mostly concerned about survival.

**Greater client responsiveness.** Perhaps even more important than operational innovations, trucking companies introduced significant innovations in their relations with downstream users. This greater responsiveness to user needs has been the most widespread adopted new practice, instituted by over two-thirds of all surveyed carriers – and typically introduced in the years 1993, 1995 and 1997. Again, over two-thirds of the carriers introducing these behavior-type innovations were larger firms:

- Exclusive transport contracts with large clients (adopted by 6 out of 8 large firms, but only 2 out of 6 small firms);
- Cooperation with other carriers to improve return capacity utilization (4 out of 8 large firms, and 2 more will introduce it next year, while only 1 out of 6 small firms has such contracts);
- Exchange agreements with other carriers to broaden geographical reach (4 out of 6 large firms, and 1 more will introduce it this year, while only 1 small firm has exchange agreements).
- Specialised staff assigned to provide comprehensive logistics solutions rather than merely taking orders (6 out of 8 large companies, and 1 more will introduce it this year, while only 2 out of 6 small firms have specialised staff).
- Standardised process for purchasing, maintaining, and reselling trucks (5 out of 8 large firms and 1 more is considering to introduce it, while only 1 out of 6 small firms has such process).

**Productivity on the rise.** These innovations appear to have had a significant impact on productivity in the industry. Based on nationwide statistics, productivity as measured by output measures per employee increased substantially, as traffic volumes measured in ton-km increased by 8.6 percent per year since 1989 and measured in tons by 3 percent per



year, while employment increased at less than 1 percent per year (see below). Another measurable dimension of productivity change, the average age of the entire nationwide power units fleet (tractors for pulling trailers and integrated tractor-trailers, including an overwhelming majority of older owner-operated vehicles) has also improved, though only slightly with the average age falling from roughly 14 years in 1990 to 13 years in 1997. As shown in figure 4, purchases of new more technologically advanced equipment fell drastically during the debt crisis years of 1995-96, but have started increasing again. Projections of future purchases and renovations anticipate the average fleet age falling to roughly 6 years over the next decade.<sup>45</sup>

Survey results corroborate these nationwide statistics:

- Total kilometres per truck have either stayed constant or increased between 1989 and 1997, on a carrier by carrier basis. Overall, total kilometres per truck increased by 42 percent and total kilometres per employee increased by 75 percent.
- Average delivery times fell from 2.5 to 2 days (although the average distance carried was not controlled for in the question and may have varied somewhat between 1989 and 1997);
- Average truck fleet age of large companies fell from 5.8 to 4.8 years. It rose from 6.1 to 9.7 years for small companies.

#### *4.1.3 Profits, wages and employment*

**Sharp falls in profit margins especially by smaller firms.** Based on survey results, profits defined as pretax operating income as a percentage of revenues fell substantially in the industry. The fall in profits for smaller carriers was particularly severe, in the order of 50 percent between 1989 and 1997. Five out of 6 small firms reported that their profit margins had been reduced. Large firms also experienced falls in profit levels, but more modest ones in the order of 30 percent. Out of 8 large firms, only 3 reported reductions in profit margins, while 3 more reported no change and one actually reported an increase in profit margins.<sup>46</sup> These results suggest that small firms on average had to sacrifice their profits to stay in the market, while aggressive large firms found in differentiating the service by quality an answer to stiffer competition.

**Labor reallocation in favour of larger firms.** Nationwide road freight statistics indicate an overall modest increase in employment in the industry between 1989 and 1995 of 5.2 percent, from 509.5 to 536.1 thousand average annual remunerated employees (or roughly 0.9

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<sup>45</sup> Based on information elaborated by CANACAR from historical 1990-97 data from ANPACT and SCT.

<sup>46</sup> These findings of low profits even for large firms may be at least in part driven by deterioration in macroeconomic conditions as a result of the 1995 debt crisis. Prior to that downturn, an earlier survey of 13 carriers found an average pre-tax profitability of 17% between 1993-94. In contrast, average profitability in the US sector of large carriers was close to 21% between 1989 and 1994. A similar substantial variation in profitability between large firms was found in that survey, with the leading carrier showing 12% growth in profitability between 1993-94 while the poorest performer registered a fall of 25%. See Ibarra-Yunez (1999), p.18.

percent per year). This increase masks a surprising increase of 9 percent over the initial two-year reform period, between 1989 and 1991, followed by relative stagnation between 1991 and 1993, an upturn in 1994 and then a sizeable decline in 1995 alongside the general macroeconomic downturn associated with the debt crisis.<sup>47</sup> The survey results suggest that there was a substantial reallocation of employment in the industry. Incumbent small firms generally stay small, either contracting or expanding by a few workers. Among larger firms, less agile firms contract substantially, with one firm shedding three-quarters of its work force, from 1000 to 250 workers, while more aggressive firms expand substantially, expanding two, three or four-fold, with one firm growing from 150 to 720 workers and another from 180 to 447.

#### *4.2 Impact of reform on performance in downstream industries*

The survey of users of trucking services focused on three broad types of industries as representative of different types of common users in Mexico: agroindustrial, electronics and auto-parts firms. In addition, two companies that specialise in the import and distribution of general goods also were interviewed. For purposes of analysis, it is useful to group the 15 interviewed companies into two classes of users: (1) high-intensity users of road freight services—shippers of higher volume or higher weight bulk products where the average trucking costs account for over 10 percent of sales, consisting of agroindustrial and import distribution companies (7 companies); (2) less-intensive users – shippers of lower volume or higher value-to-weight components where average trucking costs are less than 10 percent of sales, consisting of electronics and auto-parts firms, plus one producer of plastic parts for phones, printers and other electrical appliances. In the former category, trucking was always reported as the logistics service with the most important impact on costs, while in the second category air freight was frequently mentioned as more important though efficient trucking services were still deemed as essential for the firms' continued competitiveness. A set of more detailed follow-up interviews were conducted with two agroindustrial and two electronics companies in order to attempt to control more carefully for other exogenous changes in the operating environment facing these firms, as reported in separate boxes (based on the survey instrument of appendix 2). See appendix 3 for these case studies.

##### *4.2.1 Costs*

**Lower costs and higher quality.** There are many factors that affect the inflation-adjusted cost of trucking services faced by downstream user firms. Especially among intensive users, substantial improvements in quality—including reductions in delivery times and transit losses—have positively affected the basic product provided, making an assessment of cost impact less straightforward:

- Delivery times have decreased substantially according to 6 of 7 intensive users, with the impact directly linked to trucking deregulation. Better equipment and a reduction in the number of stops taken by drivers were cited as the key factors responsible for the

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<sup>47</sup> See IMT (1997), Table 1.1.4.

decrease. The average decrease was over 40 percent. Among less intensive users, delivery times decreased for 2 respondents, and remained unchanged for 4 out of 8.

- Transit losses have also decreased substantially according to 5 of 7 intensive users, with higher quality equipment and higher levels of security provided on federal roads (especially on toll roads) cited as the main factors. The average decrease was in the order of 35 percent. Among less intensive users, transit-related losses also declined for 3 respondents, and remained unchanged for 4.
- Reduced inventory levels have led to reported cost savings in 4 out of 12 responding firms, with all four being intensive users. More reliable and rapid transport services permit user firms to make more intensive use of both just-in-time delivery of raw materials, parts and components as well as build-to-order manufacturing for outbound shipments. In one agroindustry firm interviewed, in spite of increased sales, inbound inventory levels have fallen on average from 45 to 18 days, while inventories of finished goods have fallen from 7 to 3 days.
- Direct trucking costs were reported to have fallen in real terms for 4 of the users, and all three are intensive users. Reported cost decreases related to trucking ranged from 33 percent to 15 and 5 percent declines. Upon more careful probing during follow-up interviews, even those users that reported increases of 5 or 15 percent in real terms acknowledged the importance of reversing factors such as increases in the cost of toll roads or higher quality trucking services as reflected in more rapid delivery times and significantly lower transit losses.

#### *4.2.2 Innovations and new products*

**New products – new goods, new areas and direct deliveries.** Since the onset of regulatory reform, a number of intensive users have reported the ability to deliver new products to market as a direct result of cheaper or higher quality trucking services. ‘New’ products can include products that were previously not available on the market due to previously prohibitively costly or inflexible transportation services, as well as existing products that can be economically shipped to new areas and new forms of delivering existing products (direct to customer rather than via wholesalers or retailers):

- An expanded range of distinct products has been offered by 8 of 13 respondents, including 4 of the 7 intensive users. As a specific example, a producer of fertilizer products reported increasing the range of products sold from 12 to 32, with sales of new products accounting for 30 percent of total current sales. Of this increase 70 percent was directly attributable to lower cost and higher quality trucking services, with the remainder attributable to growth in demand due to the higher level of fertilizer use in Mexican fields. As another concrete example, faster delivery times reportedly have helped a tequila producer expand the number of products (separate brands) from 3 to 45, with average delivery times falling by 20 percent (half of this decline in delivery times is directly attributed to faster trucking services, with the other half attributed to faster loading and unloading at warehouses and ports).
- Expansion of sales of existing products to new areas has been the main impact of improvements in trucking services for a number of users, including 4 of 12 survey

respondents. A large Mexican producer of time-sensitive electronic components used by other downstream firms attributes 30 percent of expanded sales (which account for 50 percent of current total sales) to higher quality trucking services, with other explanatory factors behind the increase in new clients being Nafta-related tax changes and other internal logistics-related changes such as the introduction of bar code tags and computerised systems for faster and more reliable documentation handling. As another example, sales in new areas as a fraction of total sales of a company specialising in the production and distribution of Mexican peppers account for 90 percent of total current sales. Improvements in the quality of trucking services, with losses from transit-related problems falling from 5 percent of sales to 4 percent of now-higher total sales and a 10 percent reduction in delivery times, have reportedly played a significant role in generating these expanded sales.

- Direct delivery to retailers or end-users has allowed some user companies to earn higher net margins. Based on a more in-depth set interview with an agroindustry firm, the gain from direct delivery was in the order of 0.4 percent improvement in the firm's operating margin, with the benefit arising from the joint impact of new end-user customers that receive direct deliveries and the higher net margin on such direct sales (after controlling for other factors that could also have accounted for increased direct deliveries).

**More efficient logistics systems.** Cheaper or more customer-responsive trucking services can and reportedly have led to a number of other logistics-related innovations within user firms:

- Centralizing manufacturing, using cheaper or more efficient trucking to concentrate manufacturing in fewer locations has led to reported cost savings in at least one firm. Centralizing warehousing, concentrating warehousing operations in fewer locations also has had a similar cost saving impact. The joint impact of both factors, controlling for other factors such as changes in demand and rail shipping, was in the order of a 0.6 percent improvement in a specific intensive user's operating margin.
- Rationalising loads, both through adopting standard lot sizes and containerization, has led to further cost savings for some user firms. Containerization, in turn, both contributes to cheaper transport and can play a role in decreasing damages and losses during transit. A number of interviewed firms have reported costs savings from these logistics-related changes, which in turn have generally been introduced only in the post deregulation period.
- Yet another example of improved logistics services has been the emergence of two large integrated logistics companies, each with about one million square feet of warehousing space.

#### *4.2.3 Additional economywide impacts*

**Outsourcing and enhanced rivalry.** For a variety of infrastructure services essential for entrepreneurial activity, the absence of a well-functioning market in such services requires firms to establish in-house capabilities or forego production. For road freight services, the

alternative to purchasing transport services responsive to specific user needs on the open market is to invest and maintain a private own-account fleet of trucks. From an industrywide perspective, such required fixed cost expenditures may be prohibitive for cash-starved new entrepreneurs. Although such costs are not largely sunk, tapping capital markets may not be an option for prospective entrants lacking reputation. An important additional benefit of a more competitive trucking market, therefore, is to allow firms to outsource their transport requirements, in effect converting a fixed cost into a variable cost. The benefits from enhanced new entry and rivalry for markets intensive in the use of trucking services are likely to be substantial.

**Other benefits.** As a result of reductions in truck tariffs, SECOFI has estimated that the overall distribution costs of commodities in Mexico has declined about 25 percent in real terms between 1987 and 1994. Deregulation of trucking also had an impact on the then-publicly owned railway company, Ferrocarriles Nacionales de Mexico (FNM). The reduction of trucking rates after 1989 enabled truckers to compete more effectively with FNM, causing diversion from the railway to truck transport, particularly during the period 1989-91 when rail traffic declined significantly.

## **5. Conclusions and Policy Options for Reform**

### *5.1 Successes and failures of reform*

The Mexican trucking sector is going through a radical transformation following deregulation and Mexico's entry into NAFTA. Regulatory reform should be credited with increasing competition. Its impact was smallest in the lower-end of the market that was already competitive with a large number illegal owner-operators. Mid- and large-size shippers, however, had a chance to take advantage of deregulation to reduce their trucking costs. With the overall fall in trucking prices, inefficient operators with inadequate equipment have been exiting the market. Regulatory reform also had an impact at the upper-end of the market where shippers require faster and more reliable service and are ready to pay for it. Under the former rigid regulation regime, no carrier had the incentive to offer high quality services. However, NAFTA gave a bigger boost to this market segment. With closer trading ties to the United States, Mexican firms had to upgrade their logistics operations. Large carriers, often as partners of U.S. trucking companies, have begun to offer improved services.

Main lessons of Mexico's experience for other countries include:

- The positive role of increased competition in the road freight industry in fostering economywide innovation and growth. Besides expected gains from lower trucking prices, the removal of access barriers to transport infrastructure matters by generating substantial downstream benefits, facilitating entry and new products. Delivery times and transit losses have decreased substantially. More reliable and rapid transport services have permitted user companies to reduce inventory levels and make more intensive use of both just-in-time delivery of raw materials, parts and components as well as build-to-order manufacturing for outbound shipments. More importantly, faster and more reliable trucking has allowed user companies to offer new goods, both

introducing previously unavailable products as well as making it possible for existing products to reach new areas. More customer-responsive trucking services have reportedly also led to a number of other logistics-related innovations within user firms, such as centralizing manufacturing and rationalising loads. Finally, some user firms have outsourced their transport requirements, in effect converting a fixed into a variable cost and thereby significantly lowering entry barriers.

- Successful reform requires careful planning, execution and high-level political support. A project with the objective of reforming existing regulations and introducing increased competition must devise a strategy to carefully take into account key interested stakeholders, both supporters and opponents. In the late 1980s, transport regulation in Mexico was viewed with growing disdain, particularly as a result of studies documenting the high economic costs associated with the prevailing system. The concurrent general program of structural reform was a favourable context for regulatory reform of the trucking industry. Arguably even more could have been done in the early stages of implementation to disseminate the costs of the existing system and the expected economywide benefits from increased competition. Given the potential for blockage of reforms by the trucking chamber and its members that had been benefiting from the officially sanctioned cartel, certain key steps in Mexican planning and implementation include: preparation of the initial reform by a small group independent from SCT (where certain officials who had traditionally had clientelist relations with truckers or who feared losing their positions could have sabotaged the initiative early on); presentation of the reforms to recalcitrant truckers as a 'modernization' effort rather than an antioligopoly competition thrust, with the promise of soft loans for fleet modernization in exchange for the chamber's non-opposition; a sequenced deregulation, eliminating tariff ceilings with a lag following the elimination of entry restrictions to prevent a possible consumer backlash if the forces of competition would have been initially too weak to prevent sharp price rises; unconditional support from the highest political levels, in this case from President Salinas himself.
- Sufficient attention and resources should be devoted to assist the oversight institution in adapting to postregulatory reform conditions. Regulatory reform causes profound changes in the sectoral institution of government that formerly had responsibility for the regulation. Any regulatory reform effort should assign sufficient resources to assist the organization in making the transition to postregulatory reform conditions, assisting with such tasks as defining the organization's new role, reorganizing its structure and facilitating redeployment of staff.
- Promarket rules to offset remaining market failures should be introduced concurrently with removal of distortionary anticompetition rules. Ideally, any new regulations to be introduced as appropriate complements to a more market-oriented framework (such as programs of highway safety, control of vehicle weights and dimensions, and inspections of vehicle emissions) should be implemented at the same time as the deregulation actions. In this way, there can be a smoother transition from the government-controlled to the postreform market-determined regime.
- The competition agency has a critical role to play in any regulatory reform initiative, both in terms of up-front advocacy and ex post enforcement activities. The national

competition agency should play a critical role in helping lay the groundwork for reform, by making as compelling a case as possible for the costs of the prereform regime and for the expected benefits of reform, through media relations and more systematic relationships with representatives of consumer and producer interests (chambers of commerce, small business and entrepreneurship organizations, consumer protection institutions, consumer groups, local training and research institutes and other relevant interested parties). In addition to this prereform advocacy and education role, the competition agency must play a careful postreform enforcement role to ensure that cosy cartel-like behavior stimulated by tight entry restrictions does not persist. It is very natural that public policies of segmentation and control of prices and quantities leave a strong imprint on postreform market conduct. Inefficient, anticompetitive public regulation should not be allowed to be replaced by socially inappropriate anticompetitive interfirm agreements. The experience of Mexico is instructive in this regard. At least three separate strong interventions were required by the Mexican Federal Competition Commission to discipline attempted anticompetitive practices by the trucking industry in the years following the initial regulatory reforms.

### *5.2 Potential benefits and costs of further regulatory reforms*

An interesting indicator of the need for further reforms can be derived from the perceptions of providers of road freight services themselves. Two questions were explored in survey format, a first on remaining problems facing the industry and a second on features of the current legal and regulatory framework that restrict operations or inhibit growth.

When questioned about remaining most important problems facing the road freight industry, trucking companies were near unanimous in highlighting the **security problem**, including robberies on highways and additional required payments and costs, as the number one outstanding policy issue (11 out of the 14 trucking companies surveyed identified it as one of three of four key issues, with most listing it first). The second issue in order of importance was the **continuing pressure felt by increased intensity of competition**. This issue was reflected in answers ranging from excessive competition from abroad or from the informal economy by larger carriers, unfair competition by smaller carriers (presumably from owner-operators in the informal sector who avoid all taxes), and as a problem of access of credit by some small and larger carriers (who presumably cannot raise finance at sufficiently attractive terms given rates of return in the sector). At least one large carrier reported that they did not want more foreign firms to enter given their larger size, scale economies and better financing, which suggests still insufficient (at least international) competition. A number of the carriers emphasised that they do not have access to loans at the same low rates of interest as their U.S. competitors. Interestingly, the multimodal freight broker surveyed highlighted problems of timeliness of delivery and delays in service as the most important problem, suggesting that competitive pressure still had not been sufficient to stimulate broad service satisfaction.<sup>48</sup> Finally, the third issue raised most frequently concerns **vehicle road safety**, with the issue

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<sup>48</sup> This view is supported by the Ibarra-Yunez (1999) survey, where 17 out of 25 industrial users responded in the negative to the question of whether users find supply of road freight service adequate in volume, price-competitive, complete and dependable (p.20).

arising either under the heading of excessive number of accidents, better required control of drivers, or poor condition of highways (6 of the respondents highlighted one or more of these topics, with it being one of the two issues raised by the multimodal freight broker as well).

When asked about the more specific question of key features of the current legal and regulatory framework that restrict operations or inhibit growth, the most frequently reported issue related to the **weights and dimensions rules** (5 out of 11 respondents). Answers ranged from absence of rules, lack of clarity of rules to inconsistent application (allowing old, too heavy trucks to remain on the roads in the case of a modern fleet owner, preventing old, too heavy trucks to circulate in the case of a struggling, nonmodernised company). The second most frequent issue was the relatively **high level of per-truck license payment** (*tenencia*) now required in order to operate a vehicle, allowing closer to full-cost recovery of highway maintenance expenditures. Other issues mentioned by more than one carrier include remaining ambiguities in the foreign investment law, and shortcomings of the labor law. Interestingly, the only legal/regulatory issue raised by the multimodal freight broker was problems with remaining labor unions in ports, suggesting that prior legal and regulatory barriers in trucking have largely been addressed.

Further improvements in Mexican logistics will materialise only through closer links to the U.S. truckers. Currently the truly international market segment is populated by a few Mexican trucking companies that have established different forms of partnership with U.S. carriers. This segment is probably awaiting year 2004 when U.S. trucking companies will be allowed to own Mexican companies. If and when Mexican truckers are allowed to operate into the United States, it may inject a boost to productivity improvements. These developments will benefit mainly those parts of the Mexican economy that operate internationally. As far as logistics is concerned, there is an enormous amount of know-how and experience that Mexican companies could benefit from. Moreover, Mexican companies could benefit from improved logistics services without incurring substantial restructuring costs (unlike, say, taking advantage of equity markets in the United States).

There are three main factors that hold back a full-scale logistics revolution in Mexico:

- The persistent segmentation between large, technologically sophisticated providers of road freight services and low-technology fringe providers. The parts of the broader Mexican economy that are not operating internationally still remain much less developed, relying on informal establishments for distribution and retail sales. This part of the economy cannot afford and does not seem to need improved services. Luckily for them there is a large fringe of small owner-operators to provide haphazard but inexpensive transportation services. In fact, the existence of low quality but cheap trucking is an important lifeline for small, informal businessmen. However, this fringe exists at a bigger cost to the rest of the economy. Their technically inadequate trucks are a threat to road safety, and their inadequate consolidation continues to shelter the larger carriers from more intense competition.
- The Mexican government's unwillingness to enforce technical standards and maximum load restrictions. By refusing to implement technical standards rigorously, the Mexican



government is allowing the informal sector to carry on. It is allowing a dual structure to persist that hinders more systemic modernization and more homogenous growth. Better enforcement of technical standards in trucking as well as in other areas of the small business environment will no doubt put some informal businessmen out of work, but the ensuing consolidation could very well create new opportunities of greater benefit to the economy.

- Failure to fully implement the transportation related provisions of NAFTA and to ensure more homogeneous federal-state regulatory reforms. Although pressure from increased intensity of competition is being felt in Mexico, there appears to be scope for further significant gains from additional competition that a full opening with the United States could provide, as suggested by users' emphasis on continued service quality shortcomings. U.S.-Mexico integration has lagged behind the needs of the market, with negative consequences for Mexico's international competitiveness. In addition, failure to ensure more homogeneous federal-state regulatory reforms risks undermining progress to-date in the areas of competition, environmental standards and road safety guidelines.

Progress on these remaining internal and international obstacles could yield substantial additional benefits. Indeed, answers to a final question posed to users of road freight services suggest scope for significant further economywide benefits from increased trucking service efficiency. Under the hypothetical scenario that transport and storage costs could fall by a further 50 percent, the market value of user firms was estimated by respective managers to an average of 20 percent with some firms estimating up to a 100 percent increase. Under the hypothetical scenario that the frequency of deliveries to clients could double without additional charges while maintaining the volume of sales constant, similar substantial gains to the value of user enterprises were reported.

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## Appendix 1. The Road Freight Industry In Mexico

Mexican GDP per capita is about 10 percent of its main trading partners, the United States and Canada. With a skewed income distribution, more limited car ownership, high degree of concentration in urban areas, and persistent poverty in rural areas, the Mexican economy has somewhat different transport and logistics needs than its North American neighbours.

**Mexican industry definitions.** Road freight services refers to the movement by trucks of goods (raw materials, capital goods, processed inputs, final outputs) for business purposes on the national road system (ranging from rural feeder roads, urban roads, to state and national highways), transforming a specific good at a certain location and time to the same good at another location and time. Road freight services are the most important of all combined freight and passenger transport services provided in Mexico, accounting for 40 percent of gross value added of the transport and storage sectors in 1995.<sup>49</sup> Road freight haulage units include power units (tractors used to pull trailers as well as integrated tractor-trailers, generally either two or three-axle) and separate trailers. Services offered (depending on the haulage units and goods moved) are classified either as *general cargo* or *specialised cargo* movements. Specialised cargo currently includes seven categories: hazardous materials, petroleum and its derivatives (via liquid tanker trucks), automobiles direct from the factory (via specialised vehicles), tow-trucks, tow-trucks for salvage vehicles, industrial cranes, and securities of credit-related institutions (via armoured vehicles).<sup>50</sup>

In Mexico, road freight services are further classified according to three criteria. The first criterion derives directly from the Mexican regulatory distinction between *federal* and *state* trucking companies, according to whether truckers have been granted permission to operate at the federal level or whether operations are restricted to a single or several states. Most of the available data omits information on firms and individual haulage units that are registered exclusively with state authorities.<sup>51</sup> However, this is reportedly not a major problem since exclusive intrastate traffic is minor in comparison with interstate transport. The second important criterion is between *public* (third-party, for-hire) trucking companies and *private* (in-house, own-account) trucking fleets. Again, most of the available data omits information on the size and importance of fleet trucks. About two-thirds of total cargo is transported through public trucking.<sup>52</sup> A third useful distinction regarding the structure of the industry is between *owner-operators* (entrepreneurs operating between one to five trucks) and larger trucking firms. Total recorded federal public trucking in 1996 consisted of 315,318 haulage units (two-thirds of which were power units). These haulage units were operated by 60,531 registered firms, of which 89.7 percent were owner-operators. General and specialised cargo services in terms of volume transported represented 89.6 percent and 10.4 percent of the national total, respectively. The states with the largest number of haulage units

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<sup>49</sup> See IMT (1997), Tables 1.1.1-2. Total transport and storage services, in turn, accounted for 7.6% of gross value added in Mexico in 1995.

<sup>50</sup> Perishable goods (via refrigerated trucks), goods of high volume or great weight (via specialized platform vehicles), electrical and telephone equipment, construction materials, glass, and agricultural non-processed goods and animals are all examples of products that were previously classified as requiring specialized services but are considered as part of general cargo since 1991.

<sup>51</sup> SCT, the federal Ministry of Communications and Transport is currently undertaking a massive effort to re-register and re-tag the entire national trucking fleet. That effort will result in a comprehensive registry including holders of state-only licenses, but is expected to be completed only later in 1999.

<sup>52</sup> World Bank (1993), p.7.

are Distrito Federal (22% of the total), Nuevo León (10.5%), Estado de México (7.4%) and Tamaulipas (7.3%).<sup>53</sup>

**A potentially highly competitive industry.** The markets for road freight services are quite fragmented because of the multitude of destinations (local, domestic, and international), types of goods to be transported, and multi-modality requirements.

Unfortunately, the potential competition between road and rail freight services has been minimised in Mexico by the official tariff setting policies, the rigid radial structure of tracks and the un-addressed operational problems of the state-run rail company. As a result of official tariffs, railroads mostly carry bulkier, low-value goods, such as raw materials. In 1995, grains accounted for 20 percent of tons transported, cement 15 percent, primary steel inputs for 10 percent, non-metallic minerals 9 percent and diesel fuel 7 percent (jointly over 60%). In contrast, road freight services overwhelmingly transported manufactured or processed goods, with processed industrial goods accounting for 49 percent of daily tons carried, agricultural goods 16 percent and various packaged goods a further 14 percent; with unprocessed mineral goods accounting for 4 percent.<sup>54</sup> Moreover, the initial rail network created a rigid radial structure, with all major routes passing through Mexico City. Finally, inefficient routing, maintenance and repair operations of FERRONALES (Ferrocarriles Nacionales de Mexico, the national railway) led to substantial delays, under-utilised capacity, and frequent non-availability of scheduled train services.<sup>55</sup>

**The dominance of road freight in transport services.** It is therefore not surprising that road freight transport increased its dominance over rail after deregulation. In 1989, road freight transport accounted for 65 percent of the total and rail 24 percent; the corresponding land surface transport modal split between road and rail freight was 74:26.<sup>56</sup> By 1995, road freight increased its share of domestic ton-km to 74 percent. Average road freight distance was 444 km (of a total of 220.4 billion ton-km of cargo transported). In contrast, rail accounts for 17 percent (average distance of 717 km), maritime transport for 9 percent (630 km), and air transport for a mere 0.03 percent (862 km).<sup>57</sup> The total movement of cargo over the years has been influenced by the general growth of the economy, with total cargo transport growing at an annual rate of 1.7 percent per year over the 1980-95 period in spite of a period of stagnation during the mid-eighties. Across modes, road freight increased at an annual rate of 2.5 percent, rail fell by 1.8 percent per year, while maritime and air transport had only very minor changes (maritime growing at 0.5 percent per year, air actually declining at 0.4% per year).<sup>58</sup> In terms of the important U.S.-Mexican trade flows, trucks carry 77 percent of trade in value terms, rail 9 percent, maritime 10 percent and air transport 4 percent.<sup>59</sup>

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<sup>53</sup> These statistics are from SCT (1996).

<sup>54</sup> See IMT (1997), Tables 4.3.5 and 4.2.5. It is noteworthy that the concentration of rail transport on a few raw materials has not changed substantially over the past years. In 1987, grains accounted for 24% of ton-km, primary steel inputs 19%, non-metallic minerals 10% and cement 9%, as reported in Davila Capalleja, 199x, p.300.

<sup>55</sup> Ibid, p.296.

<sup>56</sup> In contrast, the road-rail freight modal split in the US in 1989 was 41:59.

<sup>57</sup> Road freight only captures public transport and excludes private in-house while rail excludes cargo moved for own purposes. Since the former surely is more important than the latter, these numbers underestimate the importance of trucking in freight transport.

<sup>58</sup> See IMT (1997), Table 4.1.1.

<sup>59</sup> US Department of Transportation (1996).

**Infrastructure shortcomings.** Despite heavy reliance on trucking, Mexico has a sparse and inadequate highway system of only 48,087 km of paved federal roads, referred to as trunk highways (compare to Canada's 800,000). Of this total, roughly 6,000 km are so-called concession highways, which are privately owned toll roads; this is a recent development, as concession highways only accounted for about 1,000 km in 1989.<sup>60</sup> Although a welcome development, these new highways are grossly under-utilised, mostly because they are very expensive (a trip from Nuevo Laredo at the U.S. border to Acapulco can cost a trucker about US\$400). The national system is deepened by an additional 46,000 km of paved state roads, referred to as feeder roads.<sup>61</sup>

**Broader transport reform initiatives.** An attempt is currently under way to address the traditional under-utilization of rail in Mexico. As part of a recent effort to restructure and modernise the Mexican rail system, the Constitution was reformed in February 1995 to open the sector to private participation through the awarding of long-term concessions on groups of lines. A subsequent May 1995 law has created the legal framework for privatization. Licenses to build and operate railways were granted, with the national grid having been divided into three main vertically integrated regional companies. The Northeast line (Ferrocarril del Noreste), one of the country's busiest, was sold to a Mexican-United States consortium in January 1997. The Northwest section (Ferrocarril del Pacifico-Norte) was sold in August 1997, and the Southeast line (Ferrocarril del Sureste) in June 1998. Interconnection services in the Mexico City valley (Terminal Ferroviaria del Valle de Mexico) are provided by a separate company jointly owned by three big railroad lines. This structure encourages competition within the rail network via regional comparisons of costs and prices. Competition with road transport is promoted by eliminating the possibility of cross subsidies between regions and by stimulating the efficiency of the network.

Mexican ports also have been plagued with problems of inadequate equipment, lack of warehouse or terminal space and poor road and rail connections. Mexican ports have been decentralised since 1992, with port management—including negotiation of wharfage rates directly with steamship lines under maximum rate guidelines—formally transferred to newly created Integrated Port Authorities (APIs) in the second half of 1994. Concessions for container and other handling services at three of the country's four major ports (Altamira, Lazaro Cardenas and Manzanillo) were sold during summer 1995. Other port concessions, including handling services in Ensenada and further such services in Lazaro Cardenas and Manzanillo were sold in 1996-8. Finally, the airport infrastructure sector also has been opened up. The sale of concessions to manage the 35 (of 61) airports that do not require subsidised operations has been organized into four regional groupings, with the sales expected to be completed during 1999.

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<sup>60</sup> The government handed over the construction of all four-lane toll roads to the private sector in the early 1990s.

<sup>61</sup> See IMT (1997), Table 6.2.2.

## Appendix 2. Structured Survey Instrument: Fertilizer Company Example

		Measurement								
Innovation <sup>1</sup>	Impact <sup>2</sup>	What to Measure?	Definition of the impact variable (historical data)	Actual figure	Were there significant reversing factors?	Actual figure net of reversing factors	Fraction of change due to the specified innovation	Impact factor I (current data)	Impact on net margin	
TRUCKING										
Cheaper or higher quality trucking	Reduce cost of transportation	Cost of hiring a truck on a standard route	Percent reduction in cost of hiring a truck since 89 (in real terms or U.S. dollars)	0.15	If the trucker do not use toll roads, they may offer a further (hypothetical) discount of 6 percent.	0.21	1	Trucking costs/sales	0.21	0.0441
	Introduce new products	Sales of new products (incl. discrete quality changes)	Sales 97 of new products introduced since 89 / total sales	0.3	None	0.3	0.7	Net margin on new prods. - average net margin	0.07	0.0147
	Cover a wider geographic area (begin selling in new regions or countries reached by trucks)	Sales in new areas that are reached by trucks	Sales in new areas (reached 89-97) / sales 97	0.3	None	0.3	0.7	Net margin in new areas - average net margin	0.04	0.0084
	Make direct deliveries to more customers	Number of new customers (who start buying from you after 1989) who receive direct deliveries	Number of new direct-delivery customers / total number of direct-delivery customers in 1997	2	NO	2	0.6	Net margin for new customers - average net margin	0.01	0.0036
	Direct delivery to retailers or end users allows company to earn higher net margins	Percentage sales volume switched from wholesalers to retailers (or large customers)	Increase in (sales to retailers) / (sales to wholesalers) from 89 to 97	-0.2	Their marketing strategy focus in increasing the proportion of whole-sellers.	0	0	Net margin in sales to retailers - net margin in sales to wholesalers	0.02	0
			Increase in (sales to end-users) / (sales to retailers) from 89 to 97	0.03	Their marketing strategy focus on increasing the proportion of whole-sellers.	0	0	Net margin in sales to end-users - net margin in sales to retailers	0.02	0
	Higher quality trucking services limit losses (theft & damage) in transit	Total transit losses = uninsured losses + insurance premiums + loss prevention expenses	Reduction in total transit losses/sales from 89 to 97	0.01	None	0.01	0.8		1	0.008
	Centralize manufacturing	Concentration of manufacturing	Percent change in production output per manufacturing facility since 89 (in real terms or U.S. dollars)	8	None	8	0.5	Fixed manufacturing assets / sales	0.013	0.0052
	Centralize warehousing	Concentration of warehousing	Percent change in shipments per warehousing facility since 89 (in real terms or U.S. dollars)	3	None	3	0.5	Fixed warehousing assets / sales	0.005	0.00075
Ability to ship products without hiring a full truck	lower costs of transportation	the change in the fraction of goods shipped without hiring a full truck	change in (less than truck load shipments)/(total shipments) from 89 to 97, in tons or dollar value.	N/A	NO	N/A	N/A	Percent savings from switching away from full truck loads	N/A	0

<b>RATIONALIZING LOADS</b>										
Adopt standard lot sizes	Lower costs of handling and transportation	Average size of a shipment to customers (units or tons per shipment)	Percent change in average outbound shipment size since 89	3	Sending out larger shipments does not lead to any cost savings	0	0.6	Outbound trucking + other trans. /total trucking + other trans.	0.2	0
Containerization	Decrease damages and losses in transit	Damaged goods and losses in transit as a percentage of sales (annual)	Reduction in (losses in transit)/sales from 89 to 97	N/A	NO	0.005	0		1	0
	Allow cheaper transportation opportunities		Increase in (containerized transport) / (total transport) from 89 to 97	N/A	End of government subsidized container recycling program reduced the growth of containerization	0.05	1	Percent cost savings from shipping in a container instead of other methods (open bulk or packaged)	0.3	0
<b>MODALITY</b>										
Exploiting multi-model transportation opportunities	Lower transportation costs, faster service	Change in the composition of transport use (trucks, rail, maritime)	Increase in non-truck transport / total transportation from 89 to 97	-0.02	Better trucking services led to a substitution away from rail	0	0.8	Percent cost savings from using other modes instead of trucking	0.1	0
<b>INVENTORIES</b>										
Higher quality transport services allow more timely deliveries or shipments	Using just-in-time delivery of raw material, parts, and components cuts down inventory levels	Reduction in in-bound inventory levels	Reduction in average days of in-bound inventory from 89 to 97	1.5	NO	1.5	0.7	Conversion of days	0.003	0.000287671
Build-to-order manufacturing	Reduction in finished goods inventories	Change in out-bound inventory levels	Reduction in average days of out-bound inventory from 89 to 97	-30	Without the trucking improvements, the average outbound inventory would be 4 months (instead of 2).	60	0.7	Conversion of days	0.003	0.011506849
	Reduction in obsolescence	Obsolete products written off or marked down	Reduction in obsolescence/sales from 89 to 97	N/A		N/A	1		1	0
<b>WAREHOUSING</b>										
Restructure and computerize warehousing operations	Lower costs of warehouse operation	Warehousing operations require fewer workers	Percent reduction in (number of workers)/(annual volume of warehouse operations, in tons or pesos) from 89 to 97	N/A		0	1	Number of workers in warehousing/ total number of employees	N/A	0
		Warehousing operations require less capital	Percent reduction in (total warehousing assets)/(annual volume of warehouse operations, in tons or pesos) from 89 to 97	N/A		0	1	warehousing assets/fixed assets	N/A	0
<b>INSURANCE</b>										
Get comprehensive insurance coverage	Limit losses (theft & damage) in transit	Total transit losses = uninsured losses + insurance premiums + loss prevention costs	Reduction in total transit losses/sales from 89 to 97	0.01	This reduction has nothing to do with insurance.	0	0		1	0
	Cheaper	How much the	Increase in	0	NO	0	0	(Loss claims	0	0

	insurance costs	company benefited (lost) from cheaper (more expensive) insurance	(insured freight)/(total freight) from 89 to 97					from insurance companies)/(pre miums paid) in a typical year		
<b>DOCUMENTATION</b>										
Faster and reliable documentation (enhanced property rights)	Reduce losses due to missed or untrackable deliveries (goods shipped without reliable proof of delivery)	Uncollectable receivables = shipments lost or unverifiable due to deficient documentation	Reduction in uncollectable receivables/ sales from 89 to 97	N/A	Increased workload of the court system makes it harder to prosecute fraud	0.005	0.3		1	0
Enhanced negotiability (liquidity)	More quickly receive payment for goods sold	Trade receivables/sales	Reduction in average days receivable from 89 to 97	N/A	1994 crises forced us to extend longer payment terms	2	0.8	Conversion of days	0.003	0
<b>BOTTLENECKS</b>										
Eliminate bottlenecks	Faster clearance of formalities unnecessary waiting	Reduction in idle time (idle time = total time without movement)	Reduction in average idle time/total transit time from 89 to 97	N/A	NO	0.03	0.2	(Total trucking + other transport costs) / sales	0.06	0
	Faster loading/unloading at ports, rail stations, warehouses	Reduction in idle time (idle time = total time without movement)	Reduction in average idle time/total transit time from 89 to 97	N/A	NO	0.03	0.3	(Total trucking + other transport costs) / sales	0.06	0
	Faster customs clearance	Reduction in idle time (idle time = total time without movement)	Reduction in average idle time/total transit time from 89 to 97	N/A	NO	0.03	0.3	(Total trucking + other transport costs) / sales	0.06	0
<b>TOTAL</b>									<b>9.7%</b>	

Notes: 1. Changes that have taken place at the firm level since deregulation/ increased competition.  
2. Specific areas that potentially could be affected by increased competition in trucking services.



### Appendix 3. Four Case Studies

#### 1. *Fertilizer Company*

A Mexican fertilizer company producing and distributing urea and DAP, created in 1993, provides one of the starkest examples of the downstream benefits of more competitive, market-driven trucking services. In terms of inbound logistics, roughly 80 percent of the raw materials arrive by ocean shipment to the nearest port with the remainder arriving by train from the United States. In the end, 94 percent of the inbound raw materials make the final leg of the trip to the one production plant by truck. In terms of finished goods outbound logistics, 98 percent is transported by truck to clients, with 70 percent of this total volume accounted for by trucking services directly contracted for by the company and the remainder picked up at the plant by various larger clients (retailers) who have their own in-house trucking fleet or outsource it. Inbound and outbound trucking costs jointly account for 19 percent of total costs. Total trucking costs account for 21 percent of sales (total transport costs, all modes, account for 32 percent of sales, of which 65 percent is trucking, 30 percent ocean shipping and 5 percent rail shipping). In terms of number of trucking service suppliers ideally suited to meet the company's inbound logistics needs, there was an increase from 2 to 4; in terms of outbound logistics, the number increased from 6 to 9, confirming an increased intensity of competition in service supply. In turn, the intensity of competition at the downstream level has also increased, with the number of direct competitors that could take over a significant part of its operations increasing from 4 to 10.

The cost faced by this company of hiring a truck on a standard route has reportedly fallen by 15 percent in real terms over the past five years. If the truckers were not to use toll roads, they would be able to offer the service for an additional estimated 6 percent less. The quality of the trucking services also increased, with losses in merchandise during transit falling by 50 percent. Of this reduction in total transit losses, 80 percent is estimated to be due to higher quality trucking services, with the remaining 20 percent attributed higher levels of security provided on federal roads. Higher quality transport services also allow more timely deliveries and shipments, with significant cost reductions from lower inventory holding costs. The average days of inbound inventory fell 87.5 percent, from 2 days to 6 hours, with 70 percent of this change reportedly due to improved trucking services and the remainder due to improved market conditions. The average days of outbound inventory rose from 1 to 2 months, but without trucking improvements the average outbound inventory reportedly would be 4 months (so it is actually 50 percent lower than otherwise).

These changes, in turn, have had a significant impact on innovations and new products introduced by the company. Since the onset of regulatory reform, the company has increased the number of distinct products that it sells from 12 to 32, with these changes reportedly almost totally due to improvements in trucking services. Sales of new products introduced over the past years represent 30 percent of total current sales. Of this increase, 70 percent is reportedly directly attributable to lower cost and higher quality trucking services, with the remaining 30 percent attributable to growth in demand due to the higher level of fertilizer use in Mexican fields. The

average distance in trucking-based transit from plant to sales points has increased three-fold, from 60 to 180 kilometres, suggesting that many locations that previously were not profitable now have become so. Delivery times have also been reduced by 50 percent, with a regular trip that used to take 8 hours now taking 4 hours, reportedly mainly due to better equipment and a reduction in number of stops taken by drivers. Number of employees have increased from 20 to 60.

Based on an intensive matrix survey instrument administered to this firm, the overall improvement in operating margin directly attributable to road freight innovations is 9.7 percent: reductions in trucking costs directly related to road freight innovations accounted for 4.4 percent, gains from new or improved products accounted for 3.5 percent (including reaching new areas and more direct deliveries), and savings from improved logistics accounted for the remaining 1.8 percent (including savings from centralized manufacturing and warehouses).<sup>62</sup>

## *2. Vegetable-producing Company*

Another type of company where trucking services account for a substantial part of total costs is an agroindustrial company that produces and distributes a specific class of Mexican vegetable, peppers. The company sells 10 percent of its production in the Mexican domestic market, exporting 90 percent with all foreign sales going to California (the company accounts for 4 percent of the entire California pepper market). Trucking costs account for 18 percent of total sales (the company does not use any other transport modes).

Between 1991 and 1997, the total logistics cost of the company decreased from 42 to 23 percent of average price, with trucking being the logistics service with the greatest impact on costs. In real terms, trucking costs are reported to have fallen by 5 percent. An important additional cost element that has been falling substantially is the cost of inventory holdings. Input inventories have fallen from 45 to 18 days on average, or 60 percent. Inventories of finished goods have fallen from 7 to 3 days. Without doubt, an important driving force of these changes has been the increased intensity of competition in trucking services, with the number of providers that can offer the required specialised trucking delivery services of finished goods for this type of company increasing three-fold, from 5 to 15.

Since 1991, sales in new areas as a fraction of total sales account for 90 percent of total sales. The respondent was not able to estimate, however, the extent to which this increase was due to cheaper or higher quality trucking versus other factors. Certainly, idiosyncratic factors such as the development of an array of personal contacts in California played a big part in the increased potential sales outlets. Improvements in the quality of trucking services, however, were estimated to be fully responsible for a 2 percent reduction in losses from transit-related problems (which fell from 5 percent of sales to 4 percent of now higher total sales). A fall of 10 percent in delivery times was also reported to be due to changes brought about by trucking deregulation. Number of employees have increased from 12 to 52.

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<sup>62</sup> See Appendix 2.

### *3. Electronic Components Company*

A large Mexican producer of electronic components provides an interesting picture of a company for which transport and logistics costs represent a much smaller percentage of total costs. The company has downsized, with total employees falling from 500 to 350 between 1989 and 1997. It produces mainly passive components such as electrolytic capacitors (50% of total current sales), polyester, polypropylene and ceramic capacitors, and resistors. They build to order from one production plant, and sell only to wholesalers. The electronic components are shipped to the United States (Michigan) along the Mexico City – Laredo corridor, and to the airport for container shipments to Europe and Asia. For U.S. shipments, they use the services of a smaller trucking company who transports the product to the border. The product is then transferred to a larger company for within-U.S. transport. However, the U.S. trucking company is responsible for the entire trip and quotes a single price. Total trucking costs account for roughly 2 percent of sales (total transport costs, air and trucking, are double, at approximately 4 percent of sales). In terms of number of trucking service suppliers ideally suited to meet the company's outbound logistics needs, there was an increase from 5 to 10. The intensity of competition at the downstream level increased in each individual product category, on average from 2 other firms that could take away a significant part of shipments to 4.

The cost of the Mexico City to Michigan route has increased by roughly 15 percent in U.S. dollar terms between 1993 and 1997. However, the respondent was not able to provide any estimates on the importance of reversing factors, such as increases in the cost of toll roads, higher quality trucking services or more timely deliveries. It is clear that the quality of trucking services increased substantially, with transit-related losses declining by a spectacular 90 percent. Half of this increase is reportedly due to trucking services, while the remainder is due to improved in-house packaging. Delivery times on a given segment have also decreased by 40 percent.

The main impact of improvements in trucking services appears to have been in expanding sales, with sales in new areas accounting for 50 percent of total sales, and 30 percent of this increase accounted for by higher quality trucking services. In addition, there has been a 20 percent increase in direct delivery customers, and in this case 70 percent of the increase is reported due to higher quality trucking services. There also has been a significant increase in new products, with the range of individual products in stock rising from 100 to 200; in terms of value of sales, new products only account for a reported 7 percent of total 1997 sales. In this case, improved trucking services account for less than 20 percent of this increase, with most of the change attributed to the increased price attractiveness of individual components as a result of Nafta-related tax changes and to internal measures to raise quality. There have been a number of other logistics-related internal changes, such as introducing bar code tags to improve material handling and introducing computerised systems and telecoms improvements for faster and more reliable documentation handling.

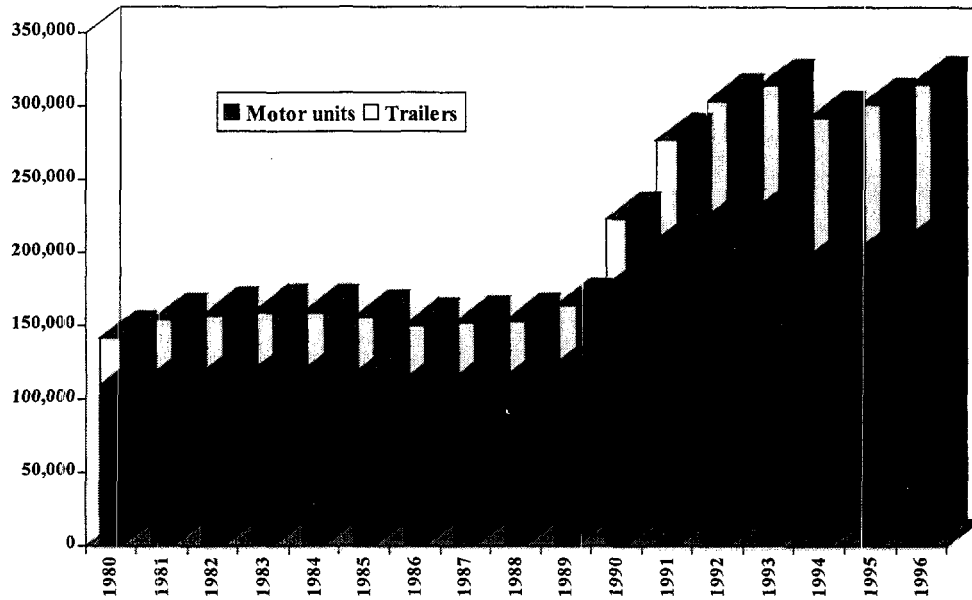
#### *4. Electronics Company*

A large multinational electronics company provides a useful illustration of impact of road freight reform where the cost of logistics is a very small fraction of total costs. The company employs 1330 workers, a slight downsizing from 1500 in 1989. It mainly produces semiconductor-rectifiers (accounting for 40 percent of sales) and 'surmeticos' (for an additional 20 percent), in addition to an array of other electronic components for export. Most of the output (80 percent) is for in-house use in other worldwide production and assembly plants, with the remainder sold directly to other companies. Total trucking costs account for 1.8 percent of sales (total transport costs, all modes, account for 4 percent of sales, of which air cargo is 50%, trucking 45% and ocean shipping 5%). In terms of inbound logistics, roughly 60 percent comes from the United States via truck, and the remainder from Europe and Asia via air and sea. In terms of outbound logistics, which is more time-sensitive, roughly 30 percent is shipped back to the United States via truck while the remainder is shipped by air to Europe and Asia. Of the five more intensively surveyed companies, it is the two electronics component producers for which air cargo is the logistics service perceived to have the greatest impact on costs. In terms of number of suppliers that are ideally suited to meet the company's inbound and outbound trucking requirements, the number has increased from 1 to 2. In terms of intensity of competition as measured by direct competitors that can take away a significant part of shipments, whereas the company was the only game in town in 1989, there are now 2 other close competitors.

The cost of a standard trucking route to end-points in the United States has increased in real terms by roughly 5 percent. The respondent mentioned a number of reversing factors, including newer trucks and tracking systems, but could not accurately estimate the impact of those improvements. The main improvements appear related to quality of service, with losses related to logistics problems having decreased by 75 percent (from 4% to 1% of sales). In addition, delivery times on a given segment have decreased by 20 percent. However, it was again not clear to the respondent how much of the increase was actually due to improved road freight services versus other factors such as improved loading and unloading facilities and more sophisticated internal software that facilitates planning and tracking.

In comparison with 1989, the firm has introduced new products, with the stock of individual products increasing from 20 to 30. Sales of new products account for 15 percent of total 1997 sales. The firm also covers a wider geographic area, with sales in new areas also accounting for roughly 15 percent of total 1997 sales. Finally, there has also been a significant increase in the number of new direct-delivery customers. However, in all these areas, it was difficult for the respondent to quantify with any degree of certainty the proportion of such new sales attributed to improvements in road freight services. It is possible that part of the difficulty especially in this instance stems from the inherent additional complexities of a multinational firm where key strategic sourcing and logistics decisions are made in headquarters located in another country.

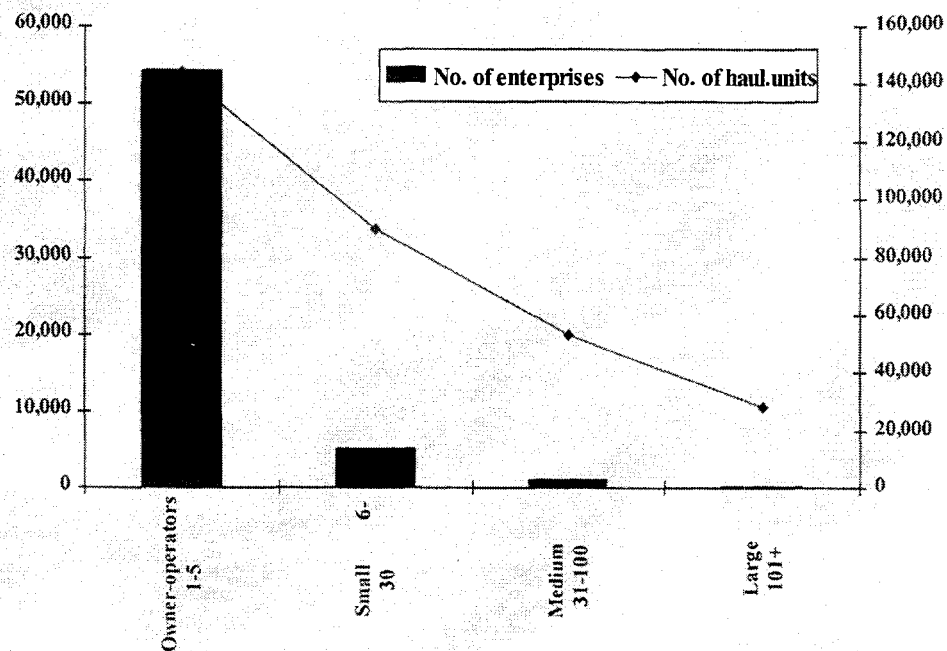
**FIGURE 1: Road freight haulage units  
of the Mexican public federal system, 1980-1996**



Year	Motor units	Trailers	Total	Year	Motor units	Trailers	Total
1980	110,810	31,120	141,930	1989	124,897	39,113	164,010
1981	117,090	36,760	153,850	1990	178,130	44,853	222,983
1982	119,309	38,216	157,525	1991	209,060	67,865	276,925
1983	120,702	38,639	159,341	1992	224,913	78,233	303,146
1984	120,702	38,639	159,341	1993	232,203	81,307	313,510
1985	117,956	38,317	156,273	1994	198,273	93,827	292,100
1986	114,000	36,500	150,500	1995	204,117	96,638	300,755
1987	115,092	37,245	152,337	1996	212,909	102,409	315,318
1988	115,897	37,506	153,403				

Source: Based on SCT (1996), Estadística Básica del Autotransporte Federal

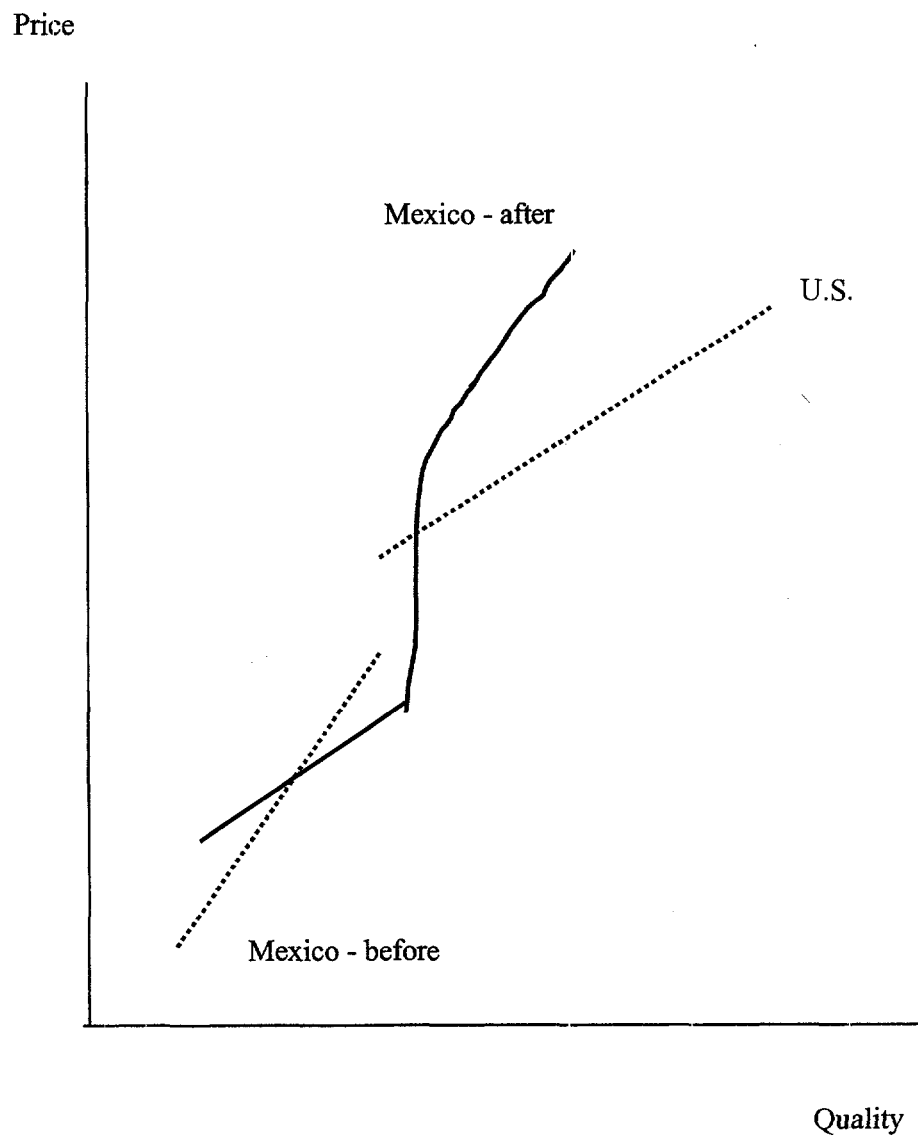
**FIGURE 2: Road freight enterprises  
according to number of haulage units, 1996**



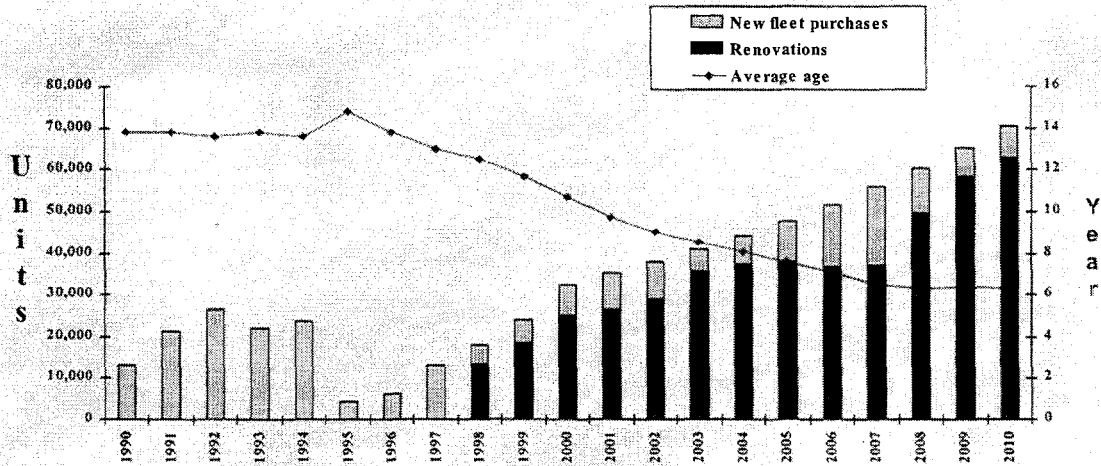
Type of enterprise	No. of units per enterprise	No. of enterprises	No. of haulage units
Owner-operator	1 – 5	54,292	144,158
Small	6 – 30	4,991	90,052
Medium	31 – 100	1,061	53,032
Large	101 +	187	28,076
<b>Total</b>		<b>60,531</b>	<b>315,318</b>

Source: Elaborated by CANACAR based on information from INEGI, Censos XI y XII de Comunicaciones y Transportes.

**FIGURE 3: Quality-price trade off in the road freight industry**



**FIGURE 4: Age of equipment (motor units) 1990-97 and projections 1998 -2010**



Year	New	Age	Year	New	Age	Year	New	Age	Year	New	Age
1990	13,125	13.8	1995	4,375	14.8	2000	32,594	10.7	2005	47,891	7.6
1991	21,345	13.6	1996	6,189	13.8	2001	35,201	9.7	2006	51,722	7.1
1992	26,431	13.0	1997	13,050	13.0	2002	38,017	9.0	2007	55,860	6.5
1993	22,010	13.8	1998	17,884	12.5	2003	41,059	8.5	2008	60,328	6.3
1994	23,659	13.6	1999	24,143	11.7	2004	44,343	8.1	2009	65,155	6.4

Source: Elaborated by CANACAR based on information from ANPACT and SCT (historical data 1990 - 1997)



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